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Rhodora

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 43. May, 1941. No. 509.

ON THE USE OF THE TERMS "SUBSPECIES" AND "VARIETY"[1]

Robert T. Clausen

Words are the means by which man expresses his ideas. In the development of a large vocabulary, the human species far surpasses all other members of the animal kingdom. This vocabulary is not a static thing. Instead, it is an ever changing affair. New ideas, new discoveries, new inventions, new thoughts:—these all require either new words or redefinitions of the old. Likewise, other words, no longer necessary, drop out of usage and become obsolete. The study of these word-changes affords a fascinating field of investigation for the philologist.

To express their precise ideas, scientists have had to choose between inventing new terms or redefining in a particular fashion old and familiar words. The terms "subspecies" and "variety" both have different shades of meaning. "Subspecies," being a scientific term, is unfamiliar in our language except among biologists. As might be expected, since "subspecies" is not a popular term, it has undergone a less varied usage than has the word "variety". Persoon seems to have introduced "subspecies" in his Synopsis Plantarum in 1805. The literature since then demonstrates the conservative usage of the term. Yet Fernald, who is the most recent and active exponent of the term variety to the exclusion of the term subspecies, in 1936, stated that "the term subspecies is used in so many ways as to be vague." Also, he stated that the term variety, "as used by such discriminating recent taxonomists as the late C. E. Moss, the late Otto Holmberg and countless others of the past (Linnaeus, Willdenow, DeCandolle, Kunth, Schlectendal, Hooker, Torrey, Gray and scores of others), is reasonably clear," but in that same publication Fernald found it necessary to set matters right by reducing to the grade of *formae* varieties of Linnaeus, Torrey and Gray, Nuttall, Lange and Pursh. Further, this reduction of *varietas* to *forma* has been going on through the years to the extent that in the pages of the single journal, Rhodora, there are 166 examples of varieties changed to forms. It is interesting to note that Fernald made 91 of these changes and that 36 times he had to correct the earlier botanists whom he claims to follow. Fernald implies that he understands what Linnaeus and Gray intended to mean by variety, but in making these corrections he modifies their application of the term. The discrepancies between taxonomists in applying the term variety clearly indicate that there has not been uniformity in its use. It seems reasonable to consider that not only is variety a popular term which has been borrowed by the scientists and given a more specialized meaning, but taxonomists themselves have not been in agreement concerning how it should be defined. While it is true that biologists regard the term variety as indicating a group of less than specific rank, non-biologists use the word as synonymous with "kind" or "species," without regard for taxonomic position. This usage can not be stopped, no matter what legislation a Botanical Congress might enact.

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[1] Printed at the author's expense to insure immediate publication.

It is questionable whether subspecific categories of different grades should be rigidly defined. According to Rehder in 1927, the botanists of Harvard University in 1904 voiced the following opinion in their proposed amendments to the Paris code: "Subspecies, varieties and forms are not sharply definable or mutually exclusive categories, it is therefore better that, although their separate rank is maintained for classificatory purposes their names should be regarded as forming a single nomenclatorial class." Today, with the steady development of an experimental method in taxonomy, these categories are much nearer definition than in 1904. Yet, it still seems desirable to permit freedom to the individual worker in his concept of categories, not only of the subspecies, but also of the specific category which is today much more capable of objective interpretation than ever before.

The new taxonomy is based on the experimental approach, with its consideration not only of gross morphology, but of histology, chromosomes and chromosomal behavior, and breeding relationships. The rising group of experimental taxonomists, of whom the late H. M. Hall was a pioneer, should not now be hampered by rigid definitions made by non-experimentalists.

In 1753, in Species Plantarum, Linnaeus employed only one subspecific category, namely the variety. This term had been carefully defined in an earlier publication, "Philosophia Botanica," 1751, also still earlier elsewhere. Quoting the English translation of Ramsbottom in 1938, variety was defined by Linnaeus as "a plant changed by an accidental cause due to the climate, soil, heat, winds, etc. It is consequently reduced to its original form by a change of soil. Further, the kinds of varieties are size, abundance, crispation, colour, taste, smell. Species and genera are regarded as always the work of Nature, but varieties as more usually owing to culture." From these words, it is evident that Linnaeus defined variety for what are now regarded as modifications by experimental taxonomists, although in practice he included both modifications and trivial genetic variations. Such variations, by modern standards, are mostly random affairs of undemonstrable evolutionary importance. Yet, in Species Plantarum, Linnaeus occasionally treated as varieties groups of greater importance than modifications and trivial variations, although his usage was preponderantly in accord with his definition in "Philosophia Botanica". The majority of the 224 named varieties in edition 1 of Species Plantarum support this contention. Before citing some of these, it should be remarked that Linnaeus did not write the abbreviation "var." before his varieties. Instead he designated the epithets in different style of printing and by Greek letters. Those modern writers who, in synonymies in taxonomic works, substitute the "var." for the Greek letters are not exactly quoting Linnaeus. Returning now to examples of Linnean varieties, these include *Tanacetum vulgare β crispum*, and *Malva verticillata β crispa*, indicating crispation of the textbook-precept; *Beta vulgaris β rubra*, indicating color; *Viburnum Opulus β roseum*, for a color variation with all flowers sterile; and varieties, too numerous to mention, of the minor horticultural sort, under species like *Prunus Cerasus* with

11 such, *P. domestica* with 14 such, *Pyrus Malus* with 6 such, and *Brassica oleracea* with 11 such.

Noting that Linnaeus occasionally designated some more important entities as varieties, for example *Circaea lutetiana β canadensis,* Fernald (1940) has claimed that in actual practice Linnaeus "generally designated as varieties indigenous plants which he considered to be natural (often geographic) variations within the broad limits of his specific concept." From this assertion, Fernald passed by easy stages to the apparent conclusion that varieties are plants with strong geographic isolation. Careful study of the 224 named varieties in Species Plantarum reveals that most Linnean varieties are no such thing, but are minor variations in color, leaf-cutting, crispation, pubescence, habit, and similar characters. An occasional one is geographically significant.

After Linnaeus, writers continued to employ the one category below the specific level until Persoon in 1805 introduced the term "subspecies" into the literature. In the introduction to his Synopsis Plantarum occurs the phrase, "varietates praecipue et subspecies non omissae sunt." Persoon's usage is poorly explained, but from the content of his work there is probable indication that the subspecies are designated by Greek letters, while the varieties follow after the specific diagnoses without special prefix. The two categories beneath the species seem only weakly differentiated by Persoon, subspecies being used for the major morphological variations and varieties for the minor ones. Persoon's publication is of significance because it seems to be the starting point for the term "subspecies." Also, it should be noted that "subspecies" was the next term after "variety" to be introduced into botanical literature for subspecific units and it was used from the first for a variation of greater value than variety. The term *forma* did not appear until later.

In 1864, Alphonse DeCandolle, in his Prodromus, made the combination *Quercus robur* subsp. *pedunculata α vulgaris.* Here the higher category was clearly designated as subspecies, while the epithet prefixed by the Greek letter was the variety. Some might argue that DeCandolle's subspecies were merely supervarieties intercalated between the species and variety, but statements from the "Laws of botanical nomenclature adopted by the

International Botanical Congress held at Paris in August, 1867," do not support this opinion. Instead, subspecies were defined as the most important variations of the species. Article 14, translated into English by H. A. Weddell, states that "Modifications of cultivated species should, where possible, be classed under the wild or spontaneous species from which they are derived. For this purpose the most striking are treated as subspecies, and when constant from seed they are called races (*proles*). Modifications of a secondary order take the name of varieties, and if there be no doubt as to their almost constant heredity by seed they are termed subraces (*subproles*)." Further, DeCandolle, in the commentary of the rules, wrote "When a modification of a species is habitually hereditary, it becomes properly speaking a *subspecies*, in other words, there may be hesitation as to whether it ought not to be called a species, and many would call it so. If its characters be less striking, and transmission by seed less frequent, every one would then call it a *variety*." Since Fernald included Alphonse DeCandolle in the army of "outstanding scholars, who correctly used the honorable old term *varietas*," whom he claims to follow, it is interesting to note that DeCandolle does not define a variety as a unit with strong morphological and geographic differences. It is true that some of DeCandolle's varieties do exhibit strong morphological and geographic differences, but it is also true that many of them are modifications of slight importance. Some of DeCandolle's varieties of the latter type have been reduced from varietal status to *formae* by Fernald. The conclusion is that in 1867, whether or not the suggestions of the rules were carefully followed, the subspecies was designated as the most important category under the species. Further, in the list of subspecific categories enumerated in Art. 10, *forma* was still not enough in general usage to be mentioned, while variety was defined in Art. 14 in a way similar to the present day concept of *forma*.

After 1867, many European workers began to employ subspecies for the most important variations under the species. The emphasis, to be sure, was on the morphology. The series of specimens in herbaria were seldom large enough to make possible a satisfactory understanding of geographical distribution. Only now are the great collections beginning to be adequate on this basis, and for many groups and regions, the available specimens are doubtless still scant indication of the true state of affairs in nature. Under these circumstances, it was scarcely possible for the older workers to have a geographical concept for subspecies, variety, or any other category. Furthermore, only in the present century has the geographical method come into its own in taxonomy. For an interesting example of the growth of this method, illustrating the trend of things later in the century, see Wettstein's "Grundzüge der geographisch-morphologischen Methode der Pflanzensystematik," 1898.

In America, Asa Gray was one of the great leaders in botanical thought in the last century. In 1836, he wrote "Any considerable change in the ordinary state or appearance of a species is termed a *variety*. These arise for the most part from two causes, viz.: the influence of external circumstances, and the crossing of races." The wording of this definition changed somewhat in later works by Gray, but the same idea seems to pervade all his writings on the subject. This idea might be paraphrased as a variation from a type. The geographical criterion for variety was not cited by Dr. Gray, although some of his varieties, probably coincidentally, were geographically isolated. Gray disposed of the term subspecies by defining it as "a marked variety."

The successors of Dr. Gray at Harvard University seem to have followed him in their concept of variety. Even Fernald, in his early papers seems to have thus interpreted the category, for several of his varieties, made at that time, do not conform to his later concept of the term and have now been reduced to the grade of *forma*. Examples are *Juncus macer* var. *Williamsii* reduced to a *forma* by Hermann in 1938, and *Scirpus atrocinctus* var. *brachypodus* and *S. cyperinus* var. *condensatus* reduced to *formae* by Blake in 1913. Although these were good varieties by the standards of the earlier botanists, 101 of whom Fernald has listed in his paper in the July, 1940, issue of Rhodora, such varieties are now treated as *formae* by Fernald and his followers, while a modification of the concept of subspecies, as understood by DeCandolle and others, has been substituted for the Linnaean definition of variety.

One of the greatest influences in American plant taxonomy in the early part of this century was the "American Code of Botanical Nomenclature" (1907). This code clearly preferred the use of subspecies for variations, lower than the species, which required nomenclatorial recognition. On the use of variety, the wording of the Note under Canon 4 is remarkably clear: "The term variety is relegated to horticultural usage."

In 1926, Hall presented a pioneer paper explaining the new experimental approach in taxonomy. He favored the term subspecies for the primary divisions of species and clearly indicated the confusion in the use of the term variety. Regarding variety, Hall wrote "the term has such a multiplicity of uses and so often applies only to races, ecologic responses, horticultural forms, or even to abnormalities that, in the opinion of the writer, its use in serious taxonomic work were better discontinued."

The earliest use of *forma* perhaps was by Miquel, who, in 1843, on page 169 of his Systema Piperacearum, described a Forma *capensis* of *Peperomia reflexa*. *Forma* is clearly a later term than subspecies, which was not even mentioned in the "Laws of nomenclature" propounded in 1867. Accordingly, if two categories beneath the species are to be recognized, as many botanists deem necessary, variety and subspecies have historical priority, the former for the minor variations of species and the latter for the more important ones.

It is not the province of this paper to discuss in detail the merits of a style of nomenclature with a single subspecific unit as contrasted with one with several subspecific units. Nor is it proposed here to explain why those variations of species are most important which are partly genetic and partly geographic or ecologic. For full discussion of these details, see the excellent papers by Clausen, Keck, and Hiesey (1939, 1940), by Dobzhansky (1937), and by various writers in the New Systematics, edited by Julian Huxley (1940). From the experimental point of view, the biologically most important natural unit under the species is the *ecotype* which can be determined only by experiment. To determine populations to be ecotypes, great care should be used: details of distribution should be meticulously plotted on maps; plants should be grown in experimental gardens; and specimens ought ideally to be analyzed both cytologically and genetically. Taxonomists, by the usual observational methods, can often detect geographic and ecologic variations which are the counterpart of the *ecotype.* Such variations are the taxonomic subspecies. Ecotypes and subspecies represent the highest category below the species level. When the experimental part of the work has not been done, the conventional taxonomic designation, subspecies, should be used alone. It is hoped that the term "subspecies" will never become as carelessly applied as has the term "variety". If that should happen, "subspecies" will have lost much of its usefulness and distinctiveness.

The experimental technique is slow and often tedious. For that reason, it will not appeal to many persons. Experimental studies in taxonomy should have the active support and cooperation of groups of biologists, each specialists in their own fields. In this way, the greatest progress can be made. To ignore the new techniques in taxonomy is not the way to progress. If there are difficulties, they must be surmounted. Science is not a static thing. To appeal to the good old days of Dr. Gray and Linnaeus is to imply such a condition. Had medical scientists followed that highly conservative policy, modern medicine might not have progressed beyond Hippocrates. Taxonomists must now be ready to accept the best information that is available from genetics, cytology, physiology, and anatomy.

If there is to be greater cooperation between workers in the various specialties of science, the barriers between zoologists and botanists must be removed. One way to achieve this is to keep the terminology as nearly similar as possible. Most vertebrate zoologists today employ the subspecies, writing the names as straight trinomials. The zoological subspecies are the largest units below the species-level which exhibit strong morphological differences and geographic distinctness. The general acceptance of subspecies by botanists for this same concept would thus represent a forward step in the direction of uniform practice. This would be a great advantage, for much ecological work is now done that considers both the plants and animals in an environment.

Critics of the subspecies say that it is a term merely substituted for variety. If these botanists see no difference between the terms, why do they in turn insist on reducing subspecies to varieties? As a matter of fact, the terms are not synonymous and changes should not be made in either direction, as is often done, without proper corroboration of fact.

As regards the argument that the use of variety is reasonably clear, the seventh edition of Gray's Manual, edited by Robinson and Fernald, may be cited. One colleague, commenting to me in a letter, reports that he has analyzed from the standpoint of consistency an unselected series of 105 varieties in it. Of these, he states that 42 are geographical, while 63 are not. Further, he points out that this inconsistency exists within the same species, where some of the varieties are mere *modifications,* while others are the equivalent of subspecies.

Some biologists claim that the use of subspecies represents merely a state of mind, and that the argument resolves itself into a matter of terminology. They argue that taxonomy has to deal with a mixed up world in which a natural ranking of units cannot be expected. They mistake the confusion caused by a lax usage of terms on the part of many taxonomists for confusion in nature. This idea of confusion is not supported by the experimental data, which indicate that nature is orderly and that at any time in man's experience, the natural units may possess a high degree of reality. If the proper use of subspecies, with a more precise meaning than the carelessly applied and confused term "variety," will contribute toward supplying a biological basis for taxonomy, its acceptance certainly should be considered by all friends of science.

In conclusion, the principal points of this discussion may now be summarized. The Linnaean variety as defined in the "Philosophia Botanica" and as illustrated by many examples in "Species Plantarum," was a variation of a minor sort within the species. Any group, worthy of some kind of recognition, but not as a full species, was treated as a variety by Linnaeus and the majority of the botanists who followed him. Variety is the oldest subspecific unit. Those botanists who employ only one category below the species-level thus have historical usage on their side, but variety is a popular term which has had and does have many shades of meaning. Next oldest subspecific unit is the subspecies. This being a technical term, has experienced a less varied usage than variety and has been employed historically for the most important variations under the species. Modern experimental taxonomy demonstrates that those morphological variations within the species are most important, which are correlated with geographic, ecologic, or physiological isolation. Such variations are the subspecies. Occasionally the varieties of the older botanists are coincidentally equivalent to subspecies, but more often these varieties are mere trivial genetic variations. On the other hand, some of the species of the older botanists are only subspecies, since large series today demonstrate intergradation. Those who restrict the use of variety to the major units beneath the species, which possess geographic, ecologic, or physiological isolation, are assigning a new meaning to the term. If botanists prefer in this manner to break with tradition by redefining *varietas* and thus prevent the development of a uniform style of nomenclature for both plants and animals, they should at least realize what they are doing. If, on the other hand, they wish to establish a more uniform style for subspecific groups in zoology and botany and continue the usage of many outstanding botanists, they can employ the subspecies for the major divisions of species and continue using variety in its traditional sense, as the horticulturists do.

In the preparation of this paper, there has been much help from many colleagues, to all of whom I express hearty thanks.

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Literature Cited

American Code of Botanical Nomenclature. 1907. Bull. Torr. Club **34:** 167–178.

Blake, S. F. 1913. Six weeks' botanizing in Vermont. Rhodora **15:** 153–168.

DeCandolle, Alphonse. 1864. Prodromus systematis naturalis regni vegetabilis. vol. 16, pt. 2.

DeCandolle, Alphonse. 1868. Laws of botanical nomenclature adopted by the International Botanical Congress held at Paris in August, 1867. Translated by H. A. Weddell. London, L. Reeve and Company. p. 1–72.

Clausen, Jens, David D. Keck, and William H. Hiesey. 1939. The concept of species based on experiment. Am. Journ. Bot. **26:** 103–106.

Clausen, Jens, David D. Keck, and W. M. Hiesey. 1940. Experimental studies on the nature of species. I. Effect of varied environments on western North American plants. Carn. Inst. Wash. Pub. No. 520. p. i-viii, 1–452.

Dobzhansky, Theodosius. 1937. Genetics and the origin of species. New York, Columbia University Press. p. i–xvi, 1–364.

Fernald, M. L. 1936. Minor forms and transfers. Rhodora **38**: 233–236.
Fernald, M. L. 1940. Some spermatophytes of eastern North America. Rhodora **42**: 239–276.
Hall, H. M. 1926. The taxonomic treatment of units smaller than species. Proc. International Congress of Plant Sciences. Ithaca. **2**: 1461–1468.
Hermann, F. J. 1938. New or otherwise interesting plants from Indiana. Rhodora **40**: 77–86.
Huxley, Julian (editor). 1940. The new systematics. Oxford, Clarendon Press. i–viii, 1–583.
Linnaeus, C. 1751. Philosophia Botanica. Stockholm, Kiesenwetter. p. 1–362, pl. 1–9.
Linnaeus, C. 1753. Species Plantarum. vols. 1 and 2.
Miquel, F. A. G. 1843. Systema Piperacearum.
Persoon, C. H. 1805. Synopsis plantarum. vols. 1 and 2.
Ramsbottom, J. 1938. Linnaeus and the species concept. Proc. Linn. Soc. London 150 (pt. 4): 192–219.
Rehder, Alfred. 1927. The varietal categories in botanical nomenclature and their historical development. Jour. Arn. Arb. **8**: 56–68.
Robinson, B. L. and M. L. Fernald. 1908. Gray's New Manual of Botany. New York, American Book Company. ed. 7. p. 1–926.

TRANSFERS IN PYROLA:—

PYROLA VIRENS Schweigg., var. **convoluta** (Barton), comb. nov. *P. convoluta* Barton, Fl. Phil. Prodr. 50 (1815). *P. chlorantha* Sw., var. *convoluta* (Barton) Fernald in RHODORA, xxii. 52 (1920).

P. VIRENS, var. **saximontana** (Fernald), comb. nov. *P. chlorantha,* var. *saximontana* Fernald, ibid. 51 (1920).

P. VIRENS, forma **paucifolia** (Fernald), comb. nov. *P. chlorantha,* var. *paucifolia* Fernald in RHODORA, l. c. (1920). *P. chlorantha,* forma *paucifolia* (Fernald) Camp in Bull. Torr. Bot. Cl. lxvii. 464 (1940). *P. paucifolia* Camp (by implication incorrectly attributed to Fernald), l. c. (1940).

Pyrola virens Schweigg. in Schweigg. & Koerte, Fl. Erlang. i. 154 (1804) antedates by six years *P. chlorantha* Sw. (1810). It has been taken up by Litardière in Briquet, Fl. Corse, iii[1]. 168 (1938), by Becherer in Ber. Schweiz. Bot. Ges. l. 413 (1940) and by Mansfeld in Fedde, Repert. xlix. 47 (1940).

M. L. FERNALD

EUPHORBIA SUBGENUS CHAMAESYCE IN CANADA AND THE UNITED STATES EXCLUSIVE OF SOUTHERN FLORIDA

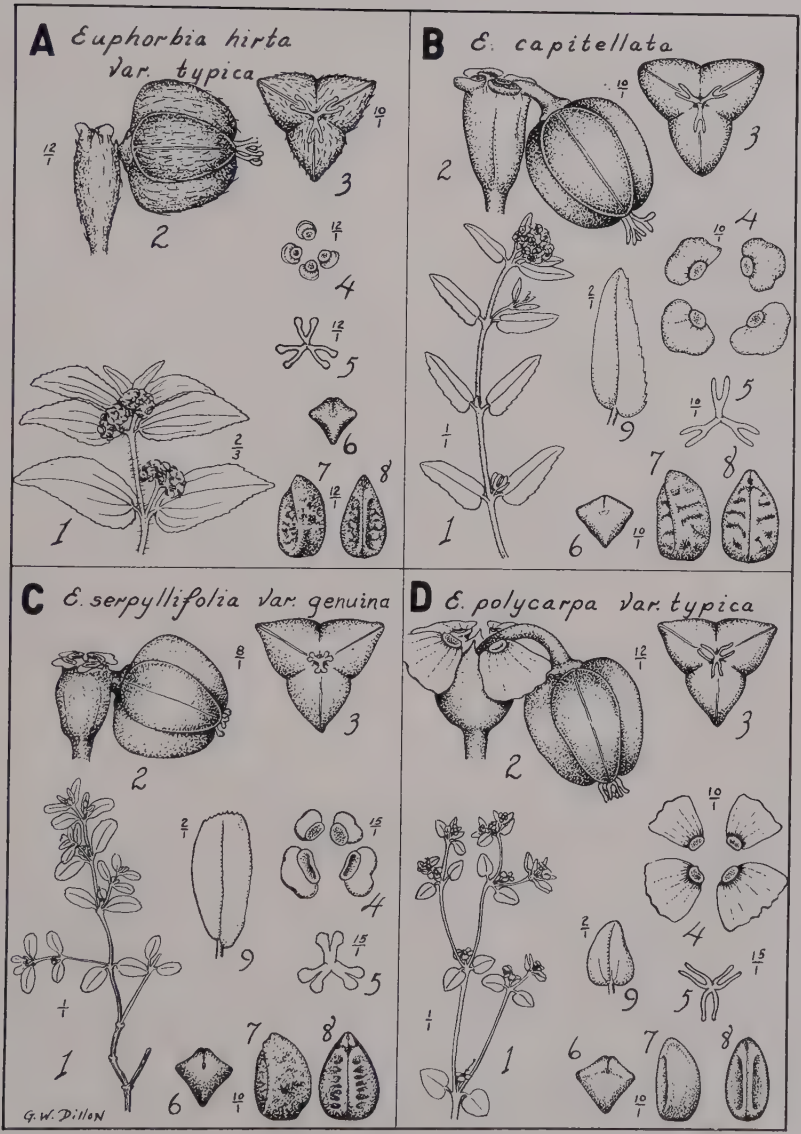
Louis Cutter Wheeler

(*Continued from page 154*)

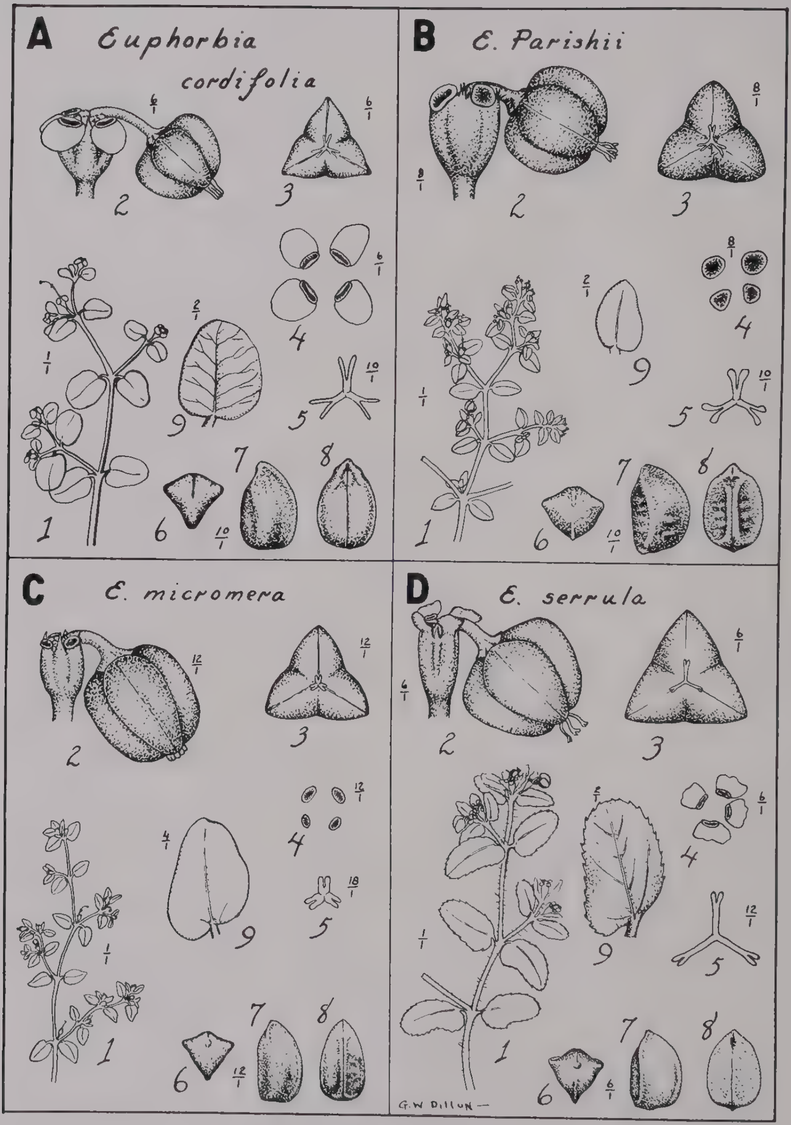
15. Euphorbia glomerifera (Millsp.) L. C. Wheeler, Contr. Gray Herb. **127:** 78. 1939; based on *Chamaesyce glomerifera* Millsp., Field Mus. Pub. Bot. **2:** 377. 1913. Type: El Rancho, Dept. Jalapa, Guatemala, alt. 1000 ft., Jan. 20, 1908, *W. A. Kellerman 8053* (F 224827! [a "6" is pencilled after the stamped herbarium number; why?]). A very robust specimen.

E. hypericifolia L. *sensu* most authors not only under *Euphorbia* but also *Anisophyllum* and *Chamaesyce.* See Contr. Gray Herb. **127:** 73–74. 1939 concerning the corrrect application of this name.

Glabrous, annual, or perhaps sometimes of slightly longer duration; stems erect, with occasional branches below, 12–50 cm. tall, from 1 mm. thick above to 4 mm. thick and slightly woody below, internodes 2–4.5 cm. long on the main stem; leaf-blades prevailingly oblong-oblanceolate but varying from oblong and oblong-spatulate to lanceolate, 1–3.5 cm. long, margin serrate or serrulate especially toward the apex and on the lower margin, base oblique; petioles 1–1.5 mm. long; stipules distinct or united, triangular, membranous, brown, 1–2 mm. long, sometimes ciliate on the inner edge; cyathia clustered in lateral and terminal cymes of mostly several to numerous cyathia; peduncles 0.6 to rarely as much as 4 mm. long, glabrous; involucre obconical, tapering gradually to the peduncle, 0.4–0.9 mm. in diam., glabrous outside, glabrous inside except for occasional short hairs at the bases of the lobes and stipes and sometimes a few above the middle of the involucre on the vascular trace leading to the gland; lobes triangular-attenuate, markedly exceeding the glands, mostly with 1–4 linear erect lateral lobes above; glands subcircular, from the merest microscopic point to 0.2 mm. in diam., on long stipes; appendages white, rotund and thrice as wide on the larger to completely wanting on the smaller glands, but some present on most of the cyathia; fifth gland from minute linear segment ¼ as long as the lobes to wholly wanting; sinus U-shaped, scarcely or not at all depressed; bracteoles from a membranous structure 2–3-parted above to a mere filiform segment opposite each gland or often wanting in some of the intervals, adnate below to the involucre, glabrous or with a few short hairs on free portion; staminate flowers 2–20 or wholly wanting in some cyathia; androphores glabrous, 1–1.1 mm. long; gynophore glabrous and sometimes reflexed; ovary glabrous, 3-lobed;



Wheeler on Euphorbia



WHEELER on EUPHORBIA

styles glabrous, bifid to about the middle, subclavate, ca. 0.4 mm. long; capsules depressed-globose, roundly 3-lobed, glabrous, 1.3–1.4 mm. long, widest at about the equator; seeds ovoid-triangular, 0.9–1 mm. long, ca. 0.5 mm. tangentially and radially, radially ovate, facets with slight irregular depressions separated by very low smooth ridges, gelatinous coat so thin as to little obscure the light brown testa.—PLATE 656C.

Southern Florida and extreme southern Texas; Bermuda, West Indies, Central America, northern South America (British Guiana, Venezuela, and Colombia), and Hawaii (MAP 2). Representative specimens seen from the United States: FLORIDA. Dade Co.: Ft. Lauderdale, *Small & Carter 644* (NY); Miami, *Tracy 9127* (G, M, NY, US); Old Rhodes Key, *Small & Mosier 5699* (NY, US); Brickell Hammock south of Miami, *Small 4036* (NY); Buena Vista, *Moldenke 330* (M, NY, US); Soldier's Key, *Britton 330* (NY); hammocks between Miami & Cocoanut Grove, *J. K. & G. K. Small 4619* (NY). Monroe Co.: Ten Thousand Islands, *Simpson 388* (G, US); Doctor's Arm, Big Pine Key, *Simpson 310* (NY, US); Big Pine Key, *Killip 31582* (US); lower portion of Key Largo, *Small & Carter 3209* (NY); No Name Key, *Pollard, Collins & Morris 126* (NY, US); Upper Metacombe Key, *Curtiss 2486* (G, M, NY, US); West Summerland Keys, *J. K. Small, J. J. Carter & G. K. Small 3627* (NY). TEXAS. Hidalgo Co.: 8 miles south of Alamo, *Clover 783* (NY); near Swallow's Club House, south of Alamo, *Clover 1475* (NY). Cameron Co.: near Brownsville, *Ferris & Duncan 3129* (NY); Brownsville, *Clover 1537* (NY); southeast of Brownsville, *Clover 1524* (NY).

16. EUPHORBIA HIRTA L., Sp. Pl. **1:** 454. 1753.

Annual; stems mostly few, mostly erect to decumbent, sometimes prostrate, 2–60 cm. long, 1–1.5 mm. thick, strigose and commonly pilose with long yellow tapering hairs especially toward the stem-tips, internodes up to 7 cm. long but mostly 1–4; leaf-blades prevailingly broadly rhombic-lanceolate, varying from narrowly lanceolate to ovate, 4–40 cm. long, sparsely strigose and glabrate above, with appressed to spreading crisped hairs beneath, base strongly inequilateral, apex acute, margin sharply to bluntly serrate; petioles 1–2 mm. long; stipules triangular, long and slenderly attenuate, ca. 1 mm. long, distinct or barely united at the base, mostly with linear divisions below, with short scattered hairs; cyathia in dense pedunculate cymose heads of numerous cyathia; peduncles glabrous to sparsely strigose; involucre obconic-campanulate, 0.6–0.9 mm. in diam., upwardly strigose outside, glabrous inside or a few hairs on the inside faces of the stipes; lobes ciliate on the outer margin, triangular, mostly about equaling the glands, the margins lacerate into erect filiform segments; glands on long stipes, cupuliform to patelliform, circular to transversely oval, 0.15–0.3 mm. in diam.; appendages white, glabrous, entire, from narrower than to twice as wide as the gland, or sometimes wholly absent; fifth gland ca. ½ as long as the lobes; sinus U-shaped, scarcely depressed; bracteoles sometimes reduced to one filiform segment below each gland but mostly forming a radial, upwardly expanding partition adnate for ca. ⅔ its length to the involucre below the glands, free portion parted into few linear shortly hairy segments shorter than the androphores; staminate flowers 2–8 per cyathium; androphores glabrous, 0.9–1 mm. long; gynophore glabrous, shortly exserted and mostly reflexed; ovary shortly strigose upwardly, 3-lobed; styles glabrous, bifid ½–⅔, 0.2–0.4 mm. long, slightly clavate; capsule 1–1.15 mm. long, sharply 3-angled, wider below the middle, shortly strigose, base truncate; seeds sharply quadrangular, 0.7–0.9 mm. long, 0.5–0.6 mm. tangentially and radially, ovate-acute radially, base truncate, facets with sub-regular to quite irregular low smooth wrinkles, ventral facets concave, dorsal concave to plane, microreticulate white coat often so thin as to little obscure the light brown to tan testa.

Key to Varieties

Cymules (clusters of cyathia) both terminal and lateral (except in depauperate plants), on *leafless* peduncles; stems sparingly branched above the base, unbranched at the tip; mostly robust erect plants with large leaves.......................... a. var. *typica*.

Cymules terminal or, if lateral, on *leafy* branchlets; stems branching freely, often forking symmetrically (or nearly so) at the tip; mostly low plants with small leaves.............. b. var. *procumbens*.

16a. E. hirta L., Sp. Pl. **1:** 454. 1753, var. typica L. C. Wheeler, Contr. Gray Herb. **127:** 68. 1939. Type: source unknown (Linnaean Herb., not seen; photograph G!; rephotograph W!). Quite typical of this widespread entity.—*E. capitata* Lam., Encyc. Meth. Bot. **2:** 422. 1786, substituted for *E. hirta* on the ground that the name was bad.—*Chamaesyce hirta* (L.) Millsp., Field Mus. Pub. Bot. **2:** 303. 1909.—*E. pilulifera* L. I *hirta* (L.) Thellung in Ascherson & Graebner, Syn. Mitteleur. Fl. **7:** 425. 1917.

E. globulifera HBK., Nov. Gen. et Sp. **2:** 56 (quarto), 45 (folio). 1817. Type: Cumana, Venezuela, *Bonpland 403* (Herb. Mus. Paris, not seen; fragment F!; photograph G!).

E. verticillata Velloso, Fl. Flum., 202. 1825, & vol. **5:** t. 16. 1827, not Poiret in Lam., Encyc. Meth. Bot. Suppl. **2:** 611. 1811. This disposal of the name is based on the plate cited.—*E. nodiflora* Steudel, Nom. Bot. ed. 2, **1:** 613. 1840.

E. pilulifera L. β *discolor* Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**): 188. 1859. Type: "On the Sonoita [Creek] near Deserted Rancho," Santa Cruz County, Arizona, Sept. 16, 1851, *C. Wright 1842* (M 144667!; photographs G!, W!; isotypes

G!, US p. p.!). Merely plants with red-spotted leaves.—*E. discolor* Engelm. ex Millsp., Field Mus. Pub. Bot. **2:** 402, 440. 1916 (without basinym) by error, as synonym of *Chamaesyce hirta.*—*E. pilulifera* L. *1.* ["Spielart"] *discolor* (Engelm.) Thellung in Ascherson & Graebner, Syn. Mitteleur. Fl. **7:** 426. 1917.

Chamaesyce Rosei Millsp., Field Mus. Pub. Bot. **2:** 402. 1916. TYPE: along an arroyo in the vicinity of Alamos, Sonora, Mexico, Mar. 13, 1910, *Rose, Standley, & Russell 12728* (NY!; fragment F!; ISOTYPE F!). A rather stunted and perhaps overwintering plant probably belonging to a race found in Sonora and Sinaloa, rather intermediate between *E. hirta* vars. *typica* and *procumbens.*

E. pilulifera L. var. *guaranitica* Chodat & Hassler, Bull. Herb. Boiss., ser. 2, **5:** 679. 1905. TYPE: in regione cursus superioris fluminis Apa, Paraguay, Nov. 1901/2, *E. Hassler 7735* (Ge?, not seen; ISOTYPE G!). A low plant with smaller leaves than usual for var. *typica.*

E. pilulifera L. *sensu* Jacquin, Icones Pl. Rar. **3:** t. 478. 1786–93; Boiss. in DC. Prod. **15** (**2**): 21. 1862; A. M. Marselt, Contribution à l'Étude Botanique, Physiologique, et Therapeutique de l'Euphorbia pilulifera, thèse pour le Doctorat en Medecine, Année 1884, No. 36, pp. VI, 62 [2], 2 plates; J. D. Hooker, Fl. Brit. India **5:** 251. 1887; Thellung in Ascherson & Graebner, Syn. Mitteleur. Fl. **7:** 423. 1917; Farwell, RHODORA **38:** 331–2. 1936; and many other authors under *Euphorbia, Anisophyllum, Chamaesyce,* and *Tithymalus.*

The following Australian forms probably belong here: *E. pilulifera* L. forma *rubromaculata*, f. *humifusa*, & f. *viridis* K. Domin, Bibliotheca Bot. Band. 22, Heft 89 (**4**): 866. 1927.

Plate 657A. Casual and not persisting in Michigan and New York; South Carolina, Florida, Alabama, Arizona, West Indies, Mexico, south to Argentina; widely introduced in the Old World (MAP 24). Representative specimens seen from the United States: MICHIGAN. Wayne Co.: Detroit, *Farwell 8756* (G). SOUTH CAROLINA. Charleston Co.: Charleston, *Fernald & Long 9747* (G). FLORIDA. Brevard Co.: Indian River region, *Fredholm 5517* (G). Hillsborough Co.: *Fredholm 6348* (G). Lake Co.: near Eustis, *Nash 157* (G). Lee Co.: Myers, *A. S. Hitchcock 326* (F, G). Manatee Co.: near Bradentown, June 2, 1890, *Simpson* (F). Monroe Co.: Upper Metacombe Key, *A. H. Curtiss 2496* (F, G). Orange Co.: *Fredholm 5429* (G). Palm Beach Co.: Palm Beach, *A. H. Curtiss 5395* (G). Pasco Co.: St. Leo, Mar. 24, 1927, *O'Neill* (M). Pinellas Co.: near St. Petersburg, *Deam 2762* (F, G). Seminole Co.: Sanford, Oct. 8, 1892, *Leeds* (F). ALABAMA. Mobile Co.: Mobile, *Dukes 6* (G); Mobile, Sept., 1878, *Mohr* (G). ARIZONA. Cochise Co.: near Fort Huachuca, Huachuca Mts., *J. G. Lemmon 2875* (F, G). Santa Cruz Co.: Tumacacori, *Harrison & Kearney 6022* (G, US);

base of Patagonia Mts., *Peebles, Harrison & Kearney 4653* (US); Nogales, *Harrison & Kearney 6026* (US); near Patagonia, *Kearney & Peebles 10172* (US).

16b. E. HIRTA L. var. PROCUMBENS (DC.) N. E. Brown in Thiselton-Dyer, Fl. Trop. Afr. **6** (**1**)**:** 497. 1911; L. C. Wheeler, Contr. Gray Herb. **127:** 69, Pl. IV, C, fig. 2. 1939; based on *E. procumbens* DC., Cat. Pl. Hort. Monsp., 111. 1813, not Miller, Gard. Dict. ed. 8, *Euphorbia* 12. 1768. TYPE: probably a plant from the garden at Montpellier, France, (Geneva?, not seen).—*E. pilulifera* L. var. *procumbens* (DC.) Boiss. in DC. Prod. **15** (**2**)**:** 21. 1862.—*Chamaesyce pilulifera* (L.) Small var. *procumbens* (DC.) Small, Fl. Se. U. S., 714, 1334. 1903. Since no authentic material has been seen it has been necessary to accept without confirmation the interpretation of Boiss. in DC. Prod. **15** (**2**)**:** 21. 1862.

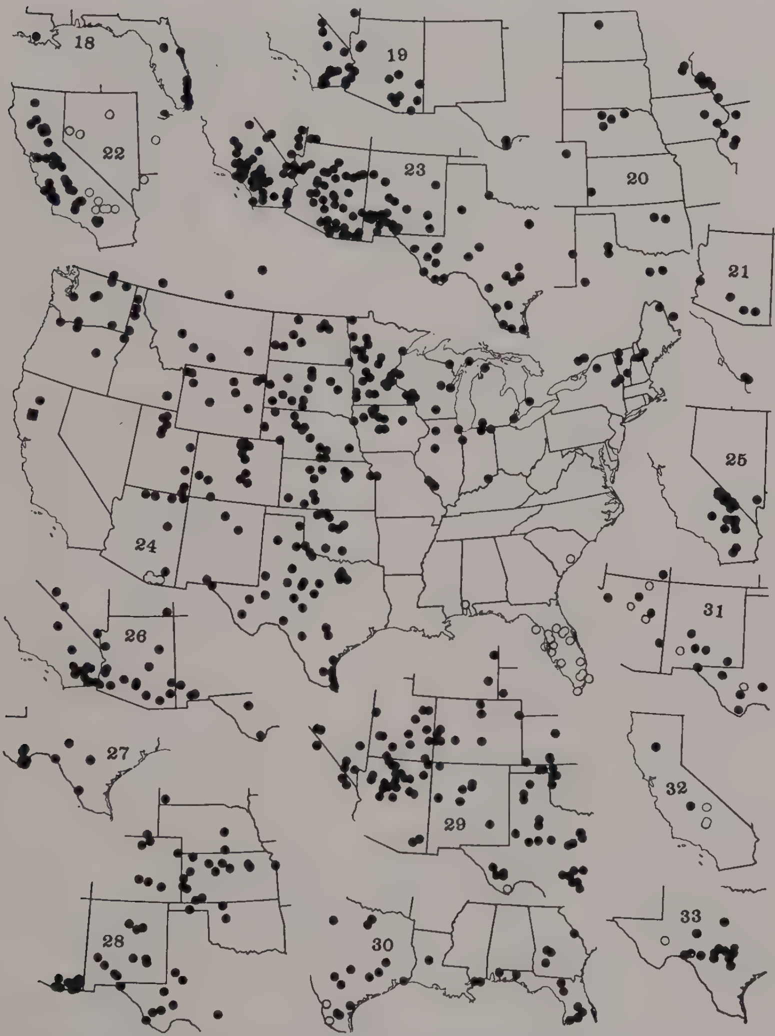
E. obliterata Jacquin, Enum. Syst. Pl. Carib., 22. 1762, & Select. Stirp. Amer. Hist., 151. 1763, at least in the sense in which it was used. *E. pilulifera* L. var. *obliterata* (Jacq.) A. S. Hitchcock, Ann. Rep. Mo. Bot. Gard. **4:** 127. 1893. No authentic material has been seen.

E. opthalmica Persoon, Syn. Pl. **2:** 13. 1807. TYPE: Rio de Janeiro, Brazil, July, 1767, *Commerson 238* (Herb. Mus. Paris, not seen; fragment F!). A small-leaved plant.

E. gemella Lag., Gen. et Sp. Nov., 17. 1816. TYPE: "Habit.[at] in N.[ova] H.[ispania]"; perhaps at Madrid judging by Alph. DC., Phytographie, 426. 1880. Supposed by Boiss. in DC. Prod. **15** (**2**)**:** 21. 1862, and others, to be the same as *E. procumbens* DC.—*Chamaesyce gemella* (Lag.) Small, Fl. Miami, 110, 200. 1913.

Florida; adventive in Pennsylvania; Louisiana; Mexico, West Indies, and South America (MAP 18). Representative specimens seen from the United States: PENNSYLVANIA. Lancaster Co.: Columbia, April, 1876, *Garber* (F). FLORIDA. Brevard Co.: Meritt's Island, Indian River, *A. H. Curtiss 2496* (F, G). Broward Co.: Pompano, *Pease 26455* (G). Dade Co.: Miami, *Tracy 9115* (G); hammocks between Miami and Cocoanut Grove, *J. K. & G. K. Small 4694* (G); Elliott's Key, *Simpson 505* (F, G); Miami, *A. H. Curtiss 5849* (F, G). Monroe Co.: Pine Crest, *Moldenke 865* (M, NY). Palm Beach Co.: Kelsey City, *Fannie R. Randolph 135* (G); Palm Beach, May 20, 1895, *A. H. Curtiss* (G). LOUISIANA. Terrebonne Co.: Houma, Sept. 6, 1912, *Wurzlow* (F).

For a review of the evidence supporting the application of the name *Euphorbia hirta* to the species described above see my discussion in Contr. Gray Herb. **127:** 71–72. 1939. Also see op. cit., 78, for reasons for applying *E. pilulifera* L., which has been applied to the concept here called *E. hirta*, to an Old World plant.



MAP 18, range of EUPHORBIA HIRTA var. PROCUMBENS in U. S. but Pennsylvanian ballast plants omitted; 19, E. SETILOBA in U. S.; 20, E. GEYERI; 21, E. TRACHYSPERMA; 22, dots E. OCELLATA var. TYPICA, circles E. OCELLATA var. ARENICOLA; 23, E. ALBOMARGINATA in U. S.; 24, dots E. GLYPTOSPERMA, circles E. HIRTA var. TYPICA in U. S. but Michigan and New York waifs omitted, square E. OCELLATA var. RATTANII; 25, E. PARISHII; 26, E. MICROMERA in U. S.; 27, E. CINERASCENS in U. S.; 28, E. STICTOSPORA in U. S.; 29, dots E. FENDLERI var. TYPICA in U. S., circle E. FENDLERI var. TRILIGULATA; 30, dots E. CORDIFOLIA, circles E. LAREDANA; 31, dots E. FENDLERI var. CHAETOCALYX, circles intergrades between E. FENDLERI vars. TYPICA and CHAETOCALYX; 32, dots E. HOOVERI, circles E. VALLIS-MORTAE; 33, dots E. ANGUSTA, circle E. ASTYLA in U. S.

17. Euphorbia capitellata Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**)**:** 188. 1859. Type: low valley at San Bernardino, Cochise County, Arizona, Oct. 3, 1851, *C. Wright 1849* (M 149810!; photographs G!, W!; isotypes G!, NY!). Rather lax and long-leaved; leaves nearly glabrous. Boissier in DC. Prod. **15** (**2**)**:** 22. 1862; L. C. Wheeler, Bull. Torr. Bot. Club **62:** 537. 1935.—*Chamaesyce capitellata* (Engelm.) Millsp., Field Mus. Pub. Bot. **2:** 408. 1916.—*E. capitellata* var. *typica* L. C. Wheeler, Bull. So. Calif. Acad. Sci. **35:** 127. 1936.

E. pycnanthema Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**)**:** 188. 1859. Type: on mountainsides near Lake Santa Maria, Chihuahua, Mexico, April 20, 1852, *C. Wright 186* (M 144666!; photographs G!, W!; isotypes G!, NY!). Compact and leaves pubescent. Boiss. in DC. Prod. **15** (**2**)**:** 22. 1862.—*Chamaesyce pycnanthema* (Engelm.) Millsp., Field Mus. Pub. Bot. **2:** 411. 1916.

E. Rusbyi Greene, Bull. Calif. Acad. Sci. **2:** 57. 1886. Type: near Prescott, Yavapai County, Arizona, June 19, 1883, *H. H. Rusby 822* (probably destroyed in 1906 when the herbarium of California Academy burned, for no specimen is in the Herbarium Greeneanum at Notre Dame according to Dr. Theodor Just in letter of Feb. 25, 1939 filed at Gray Herbarium); isotype M!; photograph of isotype G!). Pubescent, small, and erect.—*Chamaesyce Rusbyi* (Greene) Millsp., Field Mus. Pub. Bot. **2:** 411. 1916.

E. geminiloba Millsp., Proc. Calif. Acad. Sci. ser. 2, **2:** 228. 1889. Type: Pozo de Los Dolores, Lower California, Mexico, Apr. 5, 1889, *T. S. Brandegee* (F 196142!, photograph G!, W!). A specimen with the tips of the branches missing and the leaves coarsely serrate.

Euphorbia pycnanthema forma *serrata* Millsp., op. cit., 222. 1889. "Pozo de Los Dolores, April 5th" 1889, Lower California, *T. S. Brandegee* (?). The type has not been located. At least an isotype may be expected at C. The description suggests that it was based on the same minor variant and perhaps even the same specimen as *E. geminiloba.*

E. capitellata var. *laxiflora* S. Wats., Proc. Amer. Acad. Arts & Sci. **24:** 74. 1889. Type: high mountains, Guaymas, Sonora, Mexico, 1887, *Ed. Palmer 210* (G!, isotype US!). Erect with long internodes and narrow glabrous leaves.

E. Chamberlinii I. M. Johnston, Proc. Calif. Acad. Sci. ser. 4, **12:** 1066. 1924. Type: Escondido Bay, Lower California, Mexico, June 14, 1921, *I. M. Johnston 4136* (CA 1288!). Has a distinctive appearance due to an abundance of white coccids.

E. gladiosa M. E. Jones, Contr. West. Bot. **15:** 144. 1929. Type: Guaymas, Sonora, Mexico, Nov. 2, 1926, *M. E. Jones 22613* (P!). The same variant as *E. capitellata* var. *laxiflora.*

Perennial; stems few to numerous, ascending to erect, 5–40 cm. long, 0.5–1.5 mm. thick, glabrous to pubescent, internodes up to 4.5 cm. long, mostly about 1 cm. long; leaf-blades ovate-acute to linear-lanceolate, 4–25 mm. long, glabrous to pubescent, base markedly inequilateral, margin entire to coarsely and sharply serrate; petioles ca. 1 mm. long; stipules mostly distinct, triangular- to subulate-attenuate, parted into a few erect linear segments, ciliate to pubescent, 1.5–2 mm. long; cyathia congested in cymose glomerules of several to many, or a few solitary in the upper bifurcations; peduncles pubescent to glabrous, 0.5–1 or rarely to 3 mm. long; involucre campanulate to broadly obconical-campanulate, 1.3–1.7 mm. in diam., glabrous to pubescent outside, hairy on the inside of the lobes and stipes; lobes narrowly triangular, acuminate, slightly to markedly exceeding the glands; glands circular to transversely oval, 0.2–0.45 mm. in diam., on long stipes; appendages white to pink, glabrous, entire, usually conspicuous; fifth gland linear, pubescent, ½–¾ as long as the lobes; sinus U-shaped, slightly depressed; bracteoles united and forming radial partitions adnate for ca. ⅔ their length to the involucre below the gland, free portion pubescent, entire to once parted; staminate flowers 28–41 per cyathium; androphores sparsely pubescent above, or glabrous, 1.6–1.9 mm. long; ovary slightly 3-lobed, mostly pubescent, sometimes glabrous; styles ½–⅔ bifid, glabrous or sometimes with a few hairs at the base, 0.6–0.7 mm. long; capsule pubescent to glabrous, 1.3–1.9 mm. long, subacutely 3-lobed, widest at the equator or slightly below; seeds quadrangular, 1.2–1.4 mm. long, 0.6–0.8 mm. tangentially, 0.6–0.7 mm. radially, narrowly ovate to very narrowly oblong-ovate radially, apex acute, base obtuse to truncate, facets with small shallow depressions or even sub-regular faint transverse wrinkles.—PLATE 657B.

Arizona, western Texas, Chihuahua, Coahuila, Sonora, Sinaloa, Lower California (MAP 45) Representative specimens seen: TEXAS. Brewster Co.: along Blue Creek, foot-hills of Chisos Mountains, *E. J. Palmer 34199* (M, NY); near Castolon, *Cory 1907* (G). ARIZONA. Coconino Co.: Ashfork to Williams, *Kearney & Peebles 12077* (G). Yavapai Co.: Prescott, *Rusby 317* (NY, US). Gila Co.: 6 miles east of Cassadore Springs, *Maguire, Richards & Moeller 13068* (I); Roosevelt Dam, *Eastwood 8668* (G). Pinal Co.: 2 miles below Coolidge Dam, *Maguire, Richards & Moeller 10431* (G, I); Picacho Mountains, *Peebles 6493* (NY); Graham Co.: Fairview, *M. E. Jones 4097* (G, I, NY, O, US); 10 miles west of Ash Creek Ranch, San Carlos Indian Reservation, *Maguire, Richards & Moeller 10375* (G, I). Pima Co.: near Colossal Caves, Tucson, *Maguire, Richards & Moeller 11699* (G, I); east of Ranger Station, Baboquivari Mountains, *Wiegand, Maguire, Richards & Moeller 10778* (I); near Tucson, May 3, 1883, *Pringle* (NY, US), Apr. 8, 1881, *Pringle* (G, M, US), Oct. 27, 1905, *Tracy 8987* (G, M, NY, US), Oct. 29, 1905, *Tracy 8953* (G, M, NY, US). Santa Cruz Co.: Ruby to Nogales, *Peebles & Fulton 11446* (NY). Cochise Co.: near Fort Huachuca, near Huachuca Mountains, *Lemmon 3112* (G). MEXICO: Chihuahua: near Chihuahua, June 5–10, 1908, *Ed. Palmer 370* (G, US); near Chihuahua, June 5–10, 1908, *Ed. Palmer 376* (G); near Chihuahua, *Pringle 699* (G, US); 7 miles north of Charco Piedra, *Johnston 7931* (G). Coahuila: Monclova, Aug., 1880, *Ed. Palmer 1211* (G). Sonora: Guaymas, June, 1887, *Ed. Palmer 83* (G, US), Aug., 1887, *Ed. Palmer 142* (G, US), Oct., 1887, *Ed. Palmer 317* (G, US). Badebuache, *C. E. Lloyd 457* (G). Sinaloa: Culiacan, Aug. 27–Sept. 15, 1891, *Ed. Palmer 1517* (G, US). Lower California: Concepcion Bay, *Johnston 4173* (G, US); 30 miles south of Mulege, *Shreve 7096* (G).

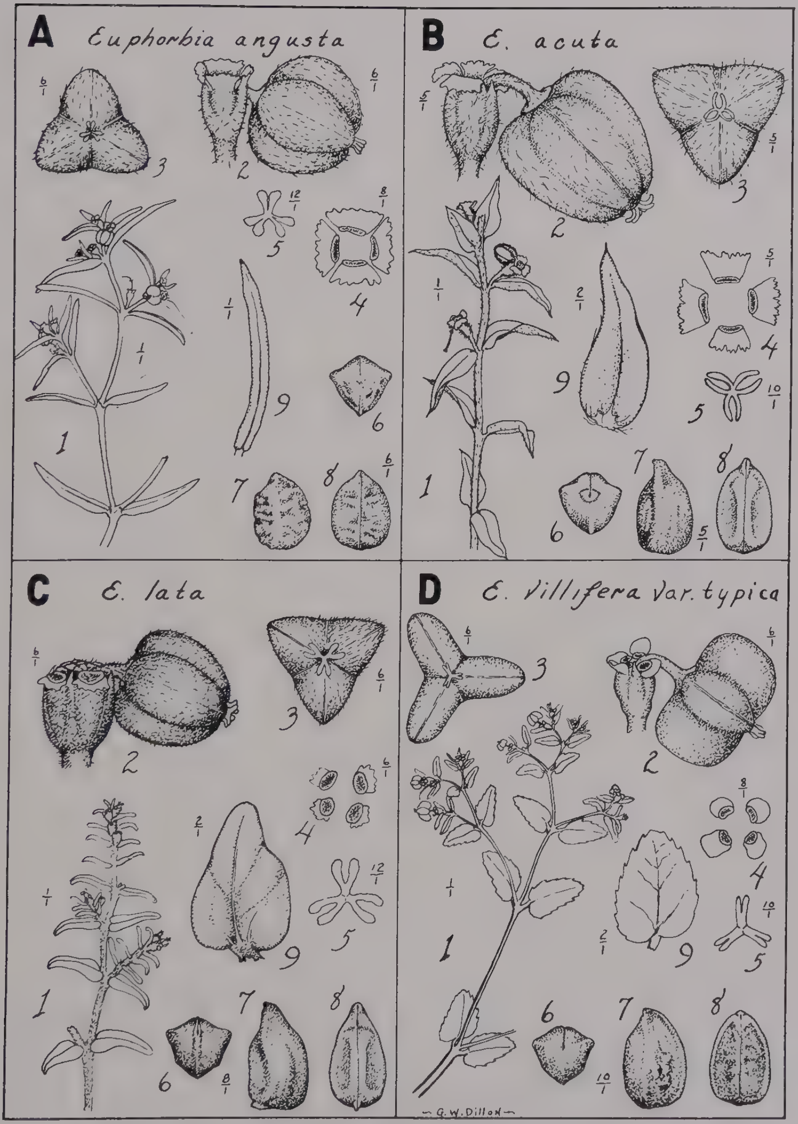
In Bull. So. Calif. Acad. Sci. **33:** 105–6. 1934, I had provisionally accepted the data on a specimen of this species which claimed to have come from an altitude of 6000–8000 feet in the San Jacinto Mountains, Riverside County, California. In view of the fact that this is the only collection purporting to have come from California and that it is far above the life zone in which it occurs in adjacent regions I am now refusing to accept as valid the data of this collection.

This species is as polymorphic as *E.pediculifera.* Both have a linear-leaved variation centering about Guaymas, Sonora. Perhaps the linear-leaved variation in one is of as much consequence as in the other. However, with some hesitation I have concluded that *E. capitellata* var. *linearifolia* is too vague and ill-defined for recognition due to the great number of intermediates in all characters.

18. Euphorbia acuta Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**)**:** 189. 1859. Boiss., Icon. Euph., t. 6. 1866. Type: "N. Mex.", 1851, *C. Wright 1839* (M 149791!; fragment F!). A good representative of the species.—*Chamaesyce acuta* (Engelm.) Millsp., Field Mus. Pub. Bot. **2:** 407. 1916.

E. acuta var. *stenophylla* Boiss. in DC. Prod. **15** (**2**)**:** 18. 1862. Type: limestone hills in the Big Bend of Devil's River, Texas, Nov., 1852, *C. Wright 1840* (Ge!; photographs G!, W!; isotypes G!, M!, US!). A narrow-leaved extreme intergrading completely.

Perennial from a farinaceous taproot as much as 1.5 cm. thick; stems annual, erect or ascending, numerous, 10–30 cm. long, to 1.5 mm. diam., with long weak hairs partially deciduous in age, internodes 1–4 cm. long; leaves sessile or subsessile, sparingly



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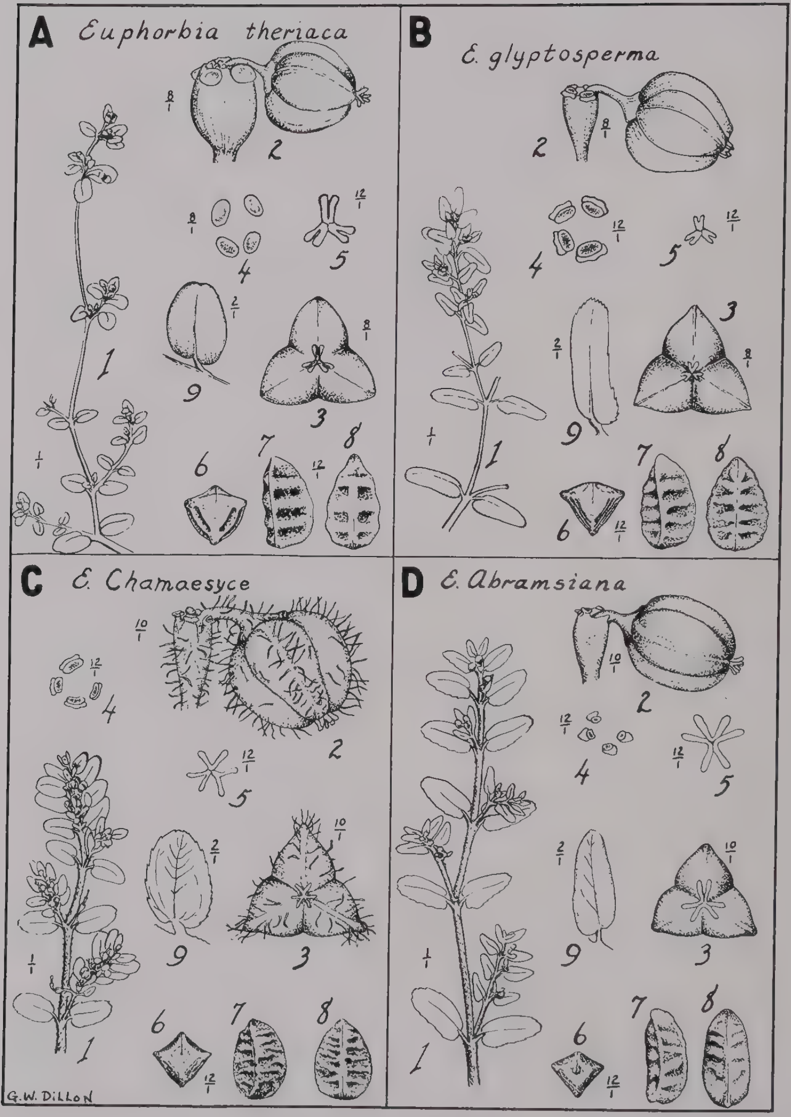

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long-villous to densely appressed-tomentose below, less so and glabrate above, mostly 1–2 cm. long, ovate-lanceolate to lanceolate, base subsymmetrical, apex long-acuminate, cartilaginous at the extreme tip, margin sometimes strongly revolute; stipules apparently wanting; peduncles stout, to 2 mm. long, sparingly to densely villous; cyathia solitary at the nodes; involucres turbinate, 1.7–2.5 mm. diam., sparsely to markedly villous without, with fine short hairs within; lobes narrowly deltoid and entire, or broader and two-toothed, equaling or slightly exceeding the glands; glands transversely elongate, slightly concave, ochroleucous, the proximal 1–1.5 mm. long, the distal shorter; appendages mostly as wide as to wider and longer than the glands, glabrous, white, margin with irregular short blunt teeth; fifth gland totally absent; sinus somewhat depressed, U-shaped; bracteoles 3–5 opposite each gland, united at the base and sometimes throughout, of various lengths, some usually nearly equaling the glands, long-hairy; staminate flowers 4–5 per fascicle, 20–25 per cyathium; androphores 2.2–2.5 mm. long, slightly exserted, with from few to numerous slender hairs throughout; gynophore hairy, exserted and reflexed at maturity; ovary densely white-hairy, styles glabrous, ca. 1 mm. long, parted to the middle, divisions somewhat flattened, recurved; capsule sharply three-lobed, 3 mm. long and in diam., short-appressed-hairy; seeds quadrangular, ovate radially, 2.2–2.5 mm. long, 1.5–1.7 mm. tangentially, 1.5 mm. radially, base oblique, coat white, microreticulate.—PLATE 659B.

Southern New Mexico, western Texas, and northern Coahuila (MAP 35). Representative specimens seen: NEW MEXICO. Sierra Co.: Lake Valley, 1915, *Beals* (US). Eddy Co.: east of Carlsbad, *Standley 40287* (US). TEXAS. Brewster Co.: Agua Fria road, *Cory 1915* (G); south of Alpine, *Cory 18593B* (G). Crockett Co.: Ozona, *M. E. Jones 26015* (M). Edwards Co.: Barksdale, *E. J. Palmer 10984a* (US). Kinney Co.: *Cory 508* (G). Pecos Co.: northeast of Fort Stockton, *Cory 1914* (G). Presidio Co.: Marfa, June 9, 1895, *Plank* (NY). Reeves Co.: Pecos City, *Neally 719* (US). Terrell Co.: Sanderson, *Orcutt 765* (US); Dryden, *Cory 2273* (G). Uvalde Co.: west of Uvalde, *M. E. Jones 28439* (M); Utopia, 1916, *E. J. Palmer 10228* (US); near Uvalde, *E. J. Palmer 33618* (NY, US). MEXICO: COAHUILA: near Diaz, *Pringle 8278* (G, M, NY, US); 100 miles north of Monclova, Sept., 1880, *Ed. Palmer* (G); 17 miles south of Allende, Aug., *Johnston 7028* (G); at foot of eastern slope of the Sierra de Puerto Santa Ana, *Wynd & Mueller 243* (M, NY, US). For citation of additional specimens see Bull. Torr. Bot. Club **63:** 435. 1936.

There seems to have been some confusion about the collections referred to this species. Engelmann in Emory, U. S. & Mex. Bound. Surv. **2** (**1**): 189. 1859, states "Stony prairies western Texas, along the San Pedro and Pecos river, &c.; *Bigelow, Schott.* (No. 1739 and 1749, Wright.)" There are before me what are presumably all the specimens of this species from the United States in the Herbarium of Missouri Botanical Garden. Yet none of the collections cited is in the suite. However, there is *Wright 1839* which I am taking as type. The most plausible explanation which occurs to me is that someone made a mistake in numbering some of these collections. All the other *Euphorbiae* of Wright's collections of the years 1851–2 bear numbers in the eighteen hundreds. (They were numbered phylogenetically by Asa Gray.) There are sheets at G, NY, and US bearing the number 1739. At both G and US someone has queried this number and added 1839. Just how Engelmann managed to cite No. 1739 when the sheet in his herbarium bore only the number 1839 is not clear. Engelmann's citation of number 1749 is even more puzzling. He did have a number 1840 which by a combination of poor handwriting and perhaps unknown circumstances was evidently converted into 1749. However, the problem can be dealt with very simply after the obvious assumption is made that there were errors in the numbers. *Wright 1839* is taken as type since it is a good specimen and entirely representative of the species. *Wright 1840* is the type collection of *Euphorbia acuta* var. *stenophylla* Boiss. and represents a narrow-leaved extreme of the species. The usual methods of elucidating the source of Wright's collections fail completely in this case. Of the three original numbers found, all came from Western Texas. It appears very likely that the material distributed as No. 1839 (or 1739) may have been from more than one of Wright's collections.

19. EUPHORBIA ANGUSTA Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**): 189. 1859. TYPE: Rocky bluffs at camp in big bend of the San Pedro (now Devil's) River, probably Valverde Co., Texas, May 21, 1851, *C. Wright 1828* (M 149804!, photographs G!, W!; ISOTYPES G!, NY!. US!). A satisfactory representative of the species. Boiss. in DC. Prod. **15** (**2**): 18. 1862, & Icon. Euph., t. 7. 1866.—*Chamaesyce angusta* (Engelm.) Small, Fl. SE U. S., 711, 1333. 1903.

Perennial; stems several to numerous, erect, 12–43 cm. tall, thinly to densely short-strigose, 1–2 mm. thick above the base, often simple below and branching only above, internodes rarely up to 8 cm. long but mostly not over 2–4 cm. long and gradually shorter upward; leaf-blades of three completely intergrading sorts, (1) the basal, ovate to elliptic-oblong, 7–15 mm. long, (2) the median, elliptic-linear to linear, acuminate, 2–4 cm. long, (3) the upper, linear, often involute on drying, 4–10 mm. long, all entire (with the exception of a few serrulate basal leaves on one plant), strigose to glabrous, especially on the upper surface; petioles 0.5–1.5 mm. long; stipules tardily deciduous, distinct, consisting of brown segments arising from interpetiolar portion of the amplexicaul petioles, bearing a few short hairs, longest segments 0.6–0.9 mm. long; peduncles 1–3 mm. long, strigose; cyathia at the upper nodes, solitary; involucres narrowly campanulate to obconical, tapering to the peduncles, 1.3–1.6 mm. in diam., strigose outside, strigose inside except on the lower half beneath the lobes; lobes short, triangular, little exceeding the glands, small and densely hairy; glands narrowly transversely oblong, 0.4–0.6 mm. long, strongly depressed in the middle, appendages ascending, white, 0.3–0.7 mm. wide, longer than the glands, with a few short appressed hairs beneath at the base, outer margin truncate, shallowly and irregularly toothed; fifth gland absent, sinus U-shaped, strongly depressed; bracteoles united at the base into a tuft adnate below to the involucre beneath the glands, densely hairy, a little shorter than the androphores; staminate flowers 16–26 per cyathium; androphores 1.3–1.4 mm. long, mostly, i. e., some in each cyathium, with sparse fine hairs; gynophore strigose, shortly exserted and usually reflexed; ovary 3-lobed, densely appressed-hairy; styles obliquely spreading to erect, 0.4–0.6 mm. long, bifid only at the stigmatic apex to ⅓ to the base, with short appressed hairs at the base; capsule strigose, 2.1–2.4 mm. long, wider than long, deeply roundly to subacutely 3-lobed, wider below the equator; seeds quadrangular, 1.6–1.9 mm. long, 1.1–1.4 mm. tangentially, 1.3–1.4 mm. radially, ovate to broadly ovate radially, base obtuse to truncate, angles blunt but definite, ventral facets plane or concave, dorsal slightly convex, both traversed by few to several low irregular transverse ridges, coat off-white to chalk-white, microreticulate, testa dark gray.—PLATE 659A.

Local in the Edward's Plateau region, western Texas (MAP 33). Representative specimens seen: TEXAS: Bandera Co.: Medina Lake Hills, *Tharp 6013* (US). Bexar Co.: on the Cibolo and Sabinas (near San Antonio), *Lindheimer 429* (G, M). Comal Co.: bed of Cibolo River, Bracken, *Groth 131* (G, NY, US). Comanche Co.: Comanche Spring, June 1849, *Lindheimer* (G, M). Edwards Co.: Ranch Expt. Station, *Cory 3188* (G). Hays Co.: San Marcos & vicinity, May, 1897, *Stanfield* (NY). Kerr Co.: Turtle Creek, *Bray 276* (US); Kerrville, *Heller 1738* (G, M, NY, US). Llano Co.: Llano, *E. J. Palmer 10287* (US). Tom

Green Co.: Knickerbocker Ranch, Dove Creek, *Tweedy 258* (US). Travis Co.: Mt. Burnell, Austin, *Hall 559* (G, M, NY, US). Valverde Co.: Devil's River, *Orcutt 6040* (M); mouth of Pecos River, *Cory 26701* (G). Wilson Co.: Sutherland Springs, Aug., 1879, *Ed. Palmer* (G).

20. Euphorbia lata Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**): 188. 1859; based on *E. dilatata* T. & G., Rep. Expl. & Surv. Railr. Miss. R. to Pacific Ocean **2** (**4**): 175. 1855, not Hochst. ex A. Richard, Tent. Fl. Abyss. **2**: 240. 1851.[1] (*E. dilatata* E. Meyer in Drege, Flora, Jena **26**: Besondere Beigabe 184. 1843, has been given as preoccupying but is a *nomen nudum.*) Type: a specimen bearing only the data "Pope's Expedition"; (NY!; photographs G!, W!; probable isotype at G! bears the data "Ex coll. Geo. Thurber, Texas, Pope").—*Alectoroctonum dilatatum* (T. & G.) Klotzsch and Garcke, Abh. Akad. Berlin, Phys. **1859**: 39. 1860.—*Chamaesyce lata* (Engelm.) Small, Fl. Se. U. S., 710, 1333. 1903.

E. rinconis M. E. Jones, Contr. West. Bot. **12**: 76. 1908. Type: Rincon, Doña Ana County, New Mexico, 1890, *M. E. Jones* (P!). This is in no wise different.

Perennial, herbage with short appressed hairs; stems ascending or erect, 10–15 cm. long, 0.5–1 mm. thick; internodes 0.5–2 cm. long; leaf-blades ovate-deltoid-falcate to long-deltoid or virtually linear in some cases by revolution of the margins, margin entire, more or less revolute; petioles ca. 1 mm. long; cyathia solitary at the nodes; involucres turbinate, 1.7–2 mm. in diam., with short appressed hairs without, glabrous within except above; lobes deltoid, entire, equaling or exceeding the glands; glands transversely oblong, ca. 0.5 mm. long, hairy beneath; appendages absent or very narrow, white, crenate; fifth gland minute or absent, with a tuft of hairs in its interval; sinus somewhat depressed; bracteoles united below into one radial appendage adnate below to the involucre opposite each gland, 4–7 parted above, not quite equaling the glands, with straight long slender hairs above; staminate flowers 5–7 per fascicle, 25–35 per cyathium; androphores 1.9–2.2 mm. long, equaling the glands, with numerous hairs above; gynophore hairy, shortly exserted and reflexed at maturity; ovary with short appressed hairs, three-angled; styles ca. 0.75 mm. long, parted to or below the middle, with very short hairs below; capsule sharply three-lobed, with appressed hairs, ca. 2.5 mm. long, 2.5 mm. in diam.; seeds quadrangular, 2 mm. long, 1 mm. radially and tangentially, long-deltoid radially, back rounded, raphal ridge straight in tangential silhouette, base obtuse-truncate, angles sharp, facets smooth, depressed, coat white, microreticulate.—Plate 659C.

Plains of Kansas, south to Texas, west to Colorado and New

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[1] Date fide Pritzel, Thes. Lit. Bot. ed. 2, 240. 1872.

Mexico (MAP 36). Representative specimens seen: KANSAS. Morton Co.: on Cimarron River, north of Elkhart on Point Rock, *Rydberg & Imler 944* (M, NY). TEXAS. Brewster Co.: 17 miles south of Alpine, *Cory 9294* (G). Coleman Co.: Coleman, April, *Reverchon 1355* (M, NY). Coryell Co.: gravelly hills, Eagle Springs, *Bigelow* (NY). Culberson Co.: near Kent, *Earle & Tracy 381* (NY); Signal Peak, Guadalupe Mountain, *Whitehouse 502* (NY). Hudspeth Co.: *Cory 1921* (G). Jeff Davis-Brewster Co.: mountain slopes between Alpine and Fort Davis, *Small & Wherry 12047* (NY). Martin Co.: near Stanton, June 12, 1900, *Eggert* (M). Mitchell Co.: north of Colorado, June 8, 1900, *Eggert* (M). Potter Co.: prairies, Amarillo, May 28, 1902, *Reverchon* (M). Presidio Co.: *Cory 1919* (G). Randall Co.: west Canyon City, Aug. 12, 1900, *Eggert* (M). Reeves Co.: plains west of the Pecos, *Earle & Tracy 104* (Mo, NY). Taylor Co.: north Abilene, June 7, 1900, *Eggert* (M). Tom Green Co.: San Angelo, *E. J. Palmer 10310* (M). County?: near the Sabinal, May 13, 1851, *C. Wright 1841* (G, M, NY). COLORADO. Baca Co.: 19 miles north Boise City, Oklahoma in Colorado state, *Stratton 441* (M). NEW MEXICO. Chaves Co.: Rosswell, alt. ca. 3800 ft., *Earle 343* (NY). Doña Ana Co.: Organ Mountains, *Vasey* (M). Lincoln Co.: Carrizozo, *Earle 592* (NY). For citation of additional specimens see Bull. Torr. Bot. Club **63:** 434. 1936. Formerly, l. c., I included some collections from Coahuila in this species. They are not at hand now. *Palmer 1205* in 1880 at G is *E. fruticulosa* Engelm.

Wright no. 1841 would have been preferable as type as far as locality-data are concerned. However, the collection chosen as type is accompanied by drawings and notes of diagnostic characters and the plants are in far better condition. Consequently, since the description seems to have been drawn from these plants, I have taken them as type. The specimens were very likely collected on the Pope Expedition in Texas somewhere near the thirty second parallel of north latitude.

21. EUPHORBIA GOLONDRINA L. C. Wheeler, Proc. Biol. Soc. Wash. **53:** 8. 1940. TYPE: along sandy beach at entrance to Boquillas Canyon, Chisos Mountains area, Brewster County, Texas, Aug. 5, 1937, *B. H. Warnock 998* (US 1726028!; fragments G!; photographs G!, W!).

Annual, glabrous; stems prostrate, to 15 cm. long, 0.7–1.5 mm. thick, internodes up to 2 cm. long; leaf-blades mostly 6–9 mm. long, oblong to narrowly oblong or even narrowly elliptic, entire, base inaequilateral; petioles ca. 1 mm. long, amplexicaul; stipules 0.7–1 mm. long, mostly glabrous, ventral united into a median, subulate, often bifid structure, dorsal distinct, linear; peduncles

1–1.5 mm. long; cyathia solitary at the nodes; involucres turbinate, 1.1–1.3 mm. diam., glabrous without, glabrous within except for short hairs at base of lobes, gland-stipes and a line extending half-way down below the stipes; lobes slenderly deltoid-attenuate, not quite equaling the glands; glands subcircular or a little longer than wide, deeply concave, sometimes folded together, 0.3–0.5 mm. in diam.; appendages white, glabrous, entire, forming a semi-lunate margin to the gland, 0.2–0.5 mm. wide; sinus U-shaped, slightly depressed, short-hairy; 5th gland linear, equaling the lobes and clothed like them; bracteoles more or less united together below and adnate to the involucre, free ends linear, short-hairy; staminate flowers 7–10 per fascicle, 39–50 per cyathium; androphores ca. 1.5 mm. long, glabrous; gynophore glabrous, exserted and reflexed at maturity; ovary glabrous, obtusely 3-angled; styles ca. 0.4 mm. long, glabrous, parted nearly to the base, slightly clavate; capsule broadly ovoid, glabrous, 3-angled, ca. 1.8 mm. long; seeds 1.6–1.8 mm. long, subquadrangular, narrowly ovate radially, base truncate, ca. 0.8 mm. radially and tangentially, facets slightly convex, irregularly wrinkled, dorsal and lateral angles blunt, raphe so low and blunt as to scarcely separate the front facets.—PLATE 664A.

Known only from the type (MAP 37).

22. EUPHORBIA PEDICULIFERA Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**): 186. 1859.

Perennial from a taproot stout in age; stems prostrate to erect, appressed-pubescent, glabrate in age, up to 2 mm. in diam. toward the base, internodes up to 5 cm. long, often very short toward the stem-tips thus congesting the cyathia; leaves closely appressed-pubescent, or sometimes closely tomentose, to subglabrous, blades 2–37 mm. long, 1–10 mm. wide, ovate with oblique base, oblong with subsymmetrical base to spathulate and even narrowly linear with symmetrical base, petioles 1–2 mm. long, amplexicaul on ventral side of stem; stipules mostly less than 0.5 mm. long, the ventral united, the upper distinct; peduncles clothed as the leaves, up to 1.5 mm. long; cyathia solitary at the nodes, sometimes congested at the branch-tips by shortening of the terminal internodes but not strictly glomerulate; involucres campanulate, 1.5–2 mm. long, closely appressed-pubescent to sub-glabrous without, more or less short-hairy within above; lobes deltoid, hairy, equaling the glands; glands transversely oblong, 0.5 mm. wide, 0.75–1.25 mm. long, dark red-purple; appendages absent or up to 2 mm. wide and 3 mm. long, entire or slightly lobed, glabrous; fifth gland very short or usually absent; sinus U-shaped, hairy, little depressed; bracteoles shorter than the androphores, usually very hairy above, in one group of 6–8 opposite each gland, united at the base and adnate to the involucre; staminate flowers 4–5 per fascicle, 22–25 per cyathium; androphores ca. 1.25 mm. long, included or shortly exserted, glabrous or with few hairs above; gynophore nearly glabrous or hairy nearly throughout, exserted and reflexed at maturity; ovary very slightly lobed, densely hairy, tapering upward; styles ca. 1 mm. long, slender, parted to the base, short-hairy on the lower side to the tip; capsule appressed-pubescent, widest below the middle, 2 mm. in diam. and long, markedly three-lobed, the lobes obtuse; seeds slenderly ovoid, 1–1.3 mm. long, 0.6–0.7 mm. diam., encircled by 4 or 5 rounded ridges with V-shaped channels between, coat white.

KEY TO VARIETIES

Leaves ovate to lanceolate with obtuse apex, rarely over 2 cm. long; bracteoles 6–8, united only at base and conspicuous. . . a. var. *typica*.
Leaves strictly linear, often over 2 cm. long, up to 3.7 cm. long; bracteoles usually inconspicuous, if conspicuous united upward . . . . b. var. *linearifolia*.

22a. E. PEDICULIFERA Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**): 186. 1859, var. TYPICA L. C. Wheeler, Bull. Torr. Bot. Club **63**: 442. 1936. TYPE: "On the Sonoita [Creek] near Deserted Rancho," Santa Cruz County, Arizona, Sept. 15, 1851, *C. Wright 1848* (M 144671!; photographs G!, W!; ISOTYPES G!, NY!). A very good representative of the species with short broad leaves and medium-sized appendages.—*Chamaesyce pediculifera* (Engelm.) Rose & Standley, Contr. U. S. Nat. Herb. **16**: 12. 1912.

E. involuta Millsp., Proc. Calif. Acad. Sci., ser. 2, **2**: 227. 1889. TYPE: Comondu, Lower California, Apr., 1889, *T. S. Brandegee* (F 196145!; photographs G!, W!; ISOTYPE C!). A plant from which the larger leaves have fallen.—*Chamaesyce involuta* (Millsp.) Millsp., Field Mus. Pub. Bot. **2**: 410. 1916.—*E. pediculifera* Engelm. var. *involuta* (Millsp.) I. M. Johnston, Proc. Calif. Acad. Sci., ser. 4, **12**: 1070. 1924.

E. conjuncta Millsp., Proc. Calif. Acad. Sci., ser. 2, **2**: 227. 1889. TYPE: Purisima, Lower California, Feb. 12, 1889, *T. S. Brandegee* (F 196147!; photographs G!, W!; ISOTYPES C!, G!). Leaves somewhat narrowed at the base, which is not unusual.—*Chamaesyce conjuncta* (Millsp.) Millsp., Field Mus. Pub. Bot. **2**: 408. 1916.

E. pediculifera Engelm. var. *inornata* T. S. Brandegee, Zoe **5**: 209. 1905. TYPE: Cofradia, vicinity of Culiacan, Sinaloa, Mexico, Oct. 23, 1904, *T. S. Brandegee* (C!; ISOTYPES F!, G!). A minor variant with appendages of glands lacking and rather short internodes.

E. vermiformis M. E. Jones, Contr. West. Bot. **16**: 23. 1930. TYPE: Ajo, Pima County, Arizona, Sept. 18, 1929, *M. E. Jones 24856* (P!; ISOTYPES G!, NY!). A variant with long internodes and long narrow leaves approaching *E. pediculifera* var. *linearifolia.*—Plate 664C, figs. 1–9.

Colorado Desert, California, southern Arizona, Baja California, Sonora, and Sinaloa (Map 6). Representative specimens seen: California. Imperial Co.: upper end of Painted Gorge, Carisso Mountains, *Ferris & Rossbach 9624* (G). Arizona. Yuma Co.: near Mohawk, *Peebles & Harrison 5021* (US); Dome to Castle Dome, *Peebles & Kearney 10939* (US). Yavapai Co.: Castle Creek, Bradshaw Mountains, *Toumey 260* (US). Maricopa Co.: Black Cañon Road, 23 miles north of Phoenix, *Gillespie 8665* (US); Camp Creek, *Harrison 1938* (US). Pinal Co.: sandy soil, ½ mile north of Mammoth, *Maguire, Richards & Moeller 10834* (G, I); Oracle, *Newlon 699* (J); near Maricopa, *Peebles, Harrison & Kearney 4909* (US). Pima Co.: Picture Rocks, Tucson Mountains, *Bartram 326* (US); sandy wash-bed, 26 miles east of Tucson, *Maguire, Richards & Moeller 11222* (G, I); Quitovaquito, *Mearns 2746* (US). Santa Cruz Co.: Patagonia and Nogales, *Peebles, Harrison & Kearney 5628* (US); hills between Calabasas and Nogales, *Tidestrom 802* (US). Cochise Co.: Bowie, *Lemmon 283* (G). MEXICO: Lower California: San Marcos Island, *Johnston 3641* (C, G, US); San Luis Gonzales Bay, *Johnston 3331* (C, G, US); near El Marmol, *Wiggins 4364* (G, US); Carmen Island, Nov. 1–7, 1890, *Ed. Palmer 835* (G, US); Cocopa Mountains, *MacDougal 122* (NY); Santa Rosalia, north of flying field, *Ferris 8697* (US); San Felipe, *Goldman 1162* (US); Isla Partida, *Collins, Kearney & Kempton 145* (US). Sonora: Hacienda Oquito (Cutting's Ranch) 6 miles east of Altar, *Wiggins 5967* (US); granitic hills, 5 miles east of Garumbullo, *Wiggins 6125* (US); Bacum Station near Rio Yaqui, *Pennell 20214* (US); 12 miles east of Libertad, *MacDougal & Shreve 48* (US); New Year's Mine, 20 miles south of Hermosillo, *M. E. Jones 22617* (G); 7 miles west of Mina San Jose on road to Misa, *Wiggins 6311* (US). Sinaloa: Topolobampo, *Rose, Standley & Russell 13276* (US). For citation of additional specimens see Bull. Torr. Bot. Club **63**: 442–443. 1936.

Some of the plants of Arizona, particularly *M. E. Jones 24856*, approach the linear-leaved var. *linearifolia.* If, however, the leaf variations here included under var. *typica* were all named little but confusion would result. Some of the plants from the hottest and driest parts of the deserts have very small whitish-tomentose leaves resembling *E. melanadenia* from which the very different seeds distinguish it.

The specimen chosen here as type was left unnamed by Engelmann. Nevertheless, this is taken as type in preference to the collection of Schott which Engelmann did name, for Schott's specimen lacks seeds and has but few cyathia. Too much weight need not be given the fact that Engelmann did not name the cited sheet of *Wright 1848* in his herbarium for there is another case in which Engelmann failed to name his specimens. Of the three numbers cited by Engelmann as *E. glyptosperma* var. *tenerrima* none was named!

22b. E. PEDICULIFERA Engelm. var. LINEARIFOLIA S. Wats., Proc. Amer. Acad. Arts & Sci. **24:** 76. 1889. TYPE: high mountains, Guaymas, Sonora, Mexico, Sept., 1887, *Ed. Palmer 215* (G!; ISOTYPES C!, US!).—PLATE 664, C, FIGS. 10–11.

Local about Guaymas, Sonora. Additional specimens seen: Guaymas, 1893, *T. S. Brandegee* (C); among rocks at foot of hills, Guaymas, Nov., 1887, *Ed. Palmer 627* (C, F, G, US); San Pedro Bay, *T. Craig 671* (P).

This variety, though extralimital, is included here for completeness since some of the Arizonan plants approach it.

23. EUPHORBIA CINERASCENS Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**): 186. 1859. TYPE: Bishops Hill near Monterey, Nuevo Leon, Mexico, Feb. 5, 1847, *J. Gregg 215* (M 46715!; photographs G!, W!; ISOTYPE G!, NY!). A satisfactory representative of the species.—*E. melanadenia* Torrey var. *subinappendiculata* Engelm., Proc. Amer. Acad. Arts & Sci. **5:** 172. 1861.[1] Boissier in DC. Prod. **15** (**2**): 32. 1862.—*Chamaesyce cinerascens* (Engelm.) Small, Fl. Se. U. S., 710, 1333. 1903.

Perennial, forming mats up to 50 cm. in diam.; stems to 30 cm. long, prostrate or decumbent, mostly slender (1 mm. diam.), clothed with crisped, short, mostly appressed hairs, internodes up to 2.5 cm. long, average ca. 1 cm.; leaf-blades 2–9 mm. long, ovate with oblique base to oblong with slightly oblique base, usually glabrous above, closely tomentose to glabrate beneath; petioles tomentose, 1–2 mm. long; stipules hairy, ca. 0.5 mm. long, ventral united, linear, dorsal distinct, linear; peduncles less than 1 mm. long, with short appressed hairs; cyathia solitary at the nodes; involucres turbinate, 1.2–1.5 mm. diam., appressed-short-hairy without, glabrous within except below the glands; lobes narrowly deltoid, copiously hairy, equaling the glands; glands transversely oblong, dark reddish-purple; appendages narrow or usually wanting; fifth gland absent; sinus U-shaped, not depressed, densely hairy; bracteoles forming a radial appendage opposite each gland, often united only below, with 5 or 6 very slender short-hairy free segments above; staminate flowers 3–4 per fascicle, 15–20 per cyathium; androphores 1.5–2 mm.

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[1] Date according to Trelease & Gray, Bot. Works Geo. Engelmann, 439. 1887.

long, glabrous; gynophore shortly appressed-hairy, exserted and reflexed at maturity; ovary copiously hoary-tomentose, roundly three-lobed; styles parted nearly to the base, 0.5–0.8 mm. long, short-hairy below, clavate; capsule 1.5–1.75 mm. long, ovoid, sharply angled, very short-tomentose; seeds quadrangular 1.2–1.5 mm. long, ca. 0.6–0.9 mm. radially, ca. 0.6–1 mm. tangentially, facets smooth or faintly wrinkled, oblong or often deltoid-oblong radially (i. e. wider below), base obtuse or truncate, apex acutish, coat white, microreticulate.—Plate 663B.

Southwestern Texas, Chihuahua, Coahuila, Nuevo Leon, San Luis Potosi, and Tamaulipas (Map 27). Representative specimens seen: Texas. Brewster Co.: Lechuguilla Flats out of Green Gulch, Chisos Mountains, *Sperry 449* (US); Chisos Mountains, *Mueller 8080* (M, NY, US). Kimble Co.: 5 miles west of Roosevelt, *Cory 21208* (G). MEXICO. Chihuahua: limestone hillside, pass 19 miles east of Jimenez, *Johnston 7851* (G); silty plain 8 miles northwest of Cruces, *Johnston 7987* (G); gravelly benches, pass between Chilicote Station & Las Animas, *Johnston 7997* (G). Coahuila: Juarez on the Sabinas River, 100 miles north of Monclova, Sept., 1880, *Ed. Palmer 1204* (F, G, US); rocky slopes of canyon, 5 miles north of Saucillo, *Johnston 7211* (G); on desert plain, 7 miles south of Hipollito, *Johnston 7240* (G); desert 41 miles west of Saltillo, *Johnston 7694* (G); Municipio de Ramos Arizpe, dry mountain slope east of Hacienda la Rosa, *Wynd & Mueller 37* (G). Nuevo Leon: Monterey, Feb. 17–26, 1880, *Ed. Palmer 1197* (G, US). San Luis Potosi: Estacion de Catorce, Sierra Madre Oriental, gravelly bed of arroyo, *Pennell 17570* (US); Charcas, *Lundell 5196* (US); rocky slopes of a hill, 11 miles south of Matehuala, *Johnston 7577* (G). Tamaulipas: Victoria, May 1–June 13, 1907, *Ed. Palmer 548* (US); Cerro de la Tamaulipeca, near San Miguel, Sierra de San Carlos, *Bartlett 10559* (US). For citation of additional specimens see Bull. Torr. Bot. Club **63**: 439–440. 1936.

24. Euphorbia vallis-mortae (Millsp.) J. T. Howell, Madroño **2**: 19. 1931. Type: a few kilometers north of Indian Wells, between Mohave and Keeler, Kern County, California, June 21, 1891, *Coville & Funston 1008* (US 16203!; fragment F!)—*Chamaesyce vallis-mortae* Millsp., Field Mus. Pub. Bot. **2**: 403. 1916.

Perennial, usually forming a dense rounded plant up to 15 cm. high; herbage hoary-tomentose throughout; stems usually arising from 2–4 cm. below the surface of the ground, this portion brown and glabrous, aërial portion to 1 mm. diam., internodes mostly 1–2.5 cm. long, but much shortened toward the tip, thereby congesting the leaves and cyathia; leaf-blades suborbicular to oblong-ovate, mostly 4–8 mm. long; lower stipules united, filiform, ca. 1 mm. long, densely hairy, upper stipules distinct, filiform, ca. 0.7 mm. long, densely hairy; cyathia solitary at the nodes; peduncles stout, to 1.5 mm. long, densely hairy; involucres campanulate, ca. 2 mm. diam., densely hairy without, with long erect hairs extending halfway down within opposite glands; lobes with long ascending hairs within, equaling or slightly exceeding the glands, deltoid, entire; glands yellowish or reddish, transversely oblong, to 1 mm. long, the distal slightly shorter; appendages white, as wide as and a little longer than the glands, entire or crenulate, with numerous short hairs beneath and on the margins and a few above; fifth gland absent; sinus U-shaped, with long erect hairs at the bottom; bracteoles mostly united into one group of 6–10 bracteoles opposite each gland, more or less united below, adnate to the involucre, sometimes with shorter bracteoles outside the fascicle, all hairy above; staminate flowers 3–5 per fascicle, 17–22 per involucre; androphores ca. 2 mm. long, slightly exserted, sometimes with a few short hairs above; gynophore densely hairy, long-exserted and reflexed at maturity; ovary three-lobed, densely hairy; styles ca. 0.5 mm. long, parted to the middle, short-hairy below; capsule tomentose, three-angled, 2 mm. long and in diam.; seeds sharply quadrangular, 1.4–1.7 mm. long, ca. 0.7 mm. tangentially and radially, ovate radially, raphe straight, back rounded in tangential silhouette, base obtusely truncate, facets smooth or nearly so, ventral facets concave, dorsal facets slightly convex, coat white, microreticulate.—PLATE 663C.

Eastern base of the Sierra Nevada from northwestern Mohave Desert north to Owen's Lake, California (MAP 32). Specimens seen: CALIFORNIA. Inyo Co.: west shore of Owens Lake, *Hall & Chandler 7323* (C, M, P). Kern Co.: Indian Wells, *Hoffmann 617* (P), *Purpus 5473* (F, G, J, M, US); 6 miles north of Freeman, *Hoffmann 585* (CA, SB); Dove Springs, 1931, *Hoffmann* (SB); Red Rock Canyon, *J. T. Howell 4973* (CA, Peir).

The particular locality-data for the type collection are lacking on the label but are given by Coville, Contr. U. S. Nat. Herb. **4:** 256. 1893.

25. EUPHORBIA MELANADENIA Torrey, Rep. Expl. & Surv. Miss. R. to Pacific Ocean **4:** 135. 1857. TYPE: "Low places near San Gabriel", Los Angeles County, California, 1853–4, *J. M. Bigelow* (NY!; photographs G!, W!; ISOTYPE G!). A good representative of the species. Munz, Man. So. Calif. Bot., 289, fig. 153. 1935, good except styles should be 3.—*Anisophyllum melanadenium* (Torr.) Klotzsch & Garcke, Abh. Akad. Berlin, Phys. **1859:** 23. 1860.—*E. polycarpa* Bentham var. *vestita* S. Wats., Bot. Calif. **2:** 73. 1880.—*Chamaesyce melanadenia* (Torr.) Millsp., Field Mus. Pub. Bot. **2:** 410. 1916.

E. cinerascens Engelm. var. *appendiculata* Engelm. in Emory, U. S. & Mex. Bound. Surv. **2** (**1**)**:** 186. 1859. Type: San Felipe, San Diego County, California, May, 1852, *Geo. Thurber 628* (M 46715!; isotypes G!, NY!). Differs in no consequential respect.—*E. polycarpa* Bentham var. *appendiculata* (Engelm.) Munz, Bull. So. Calif. Acad. Sci. **31:** 68. 1932.

Chamaesyce aureola Millsp., Field Mus. Pub. Bot. **2:** 406. 1916. Type: Azusa, Los Angeles County, California, alt. 800 feet, May 3, 1912, *H. H. Smith 4933* (F 389282!, photographs G!, W!). A good match for the type of *E. melanadenia*.

E. polycarpa Bentham *sensu* Thurston, Wild Flowers So. Calif., 181, fig. 274. 1936 (photograph).

Perennial from a taproot as much as 5 mm. in diam.; stems ascending or erect, to 20 cm. long, sometimes stout (1.5 mm. diam.) below, closely tomentose, glabrate; leaf-blades 2–9 mm. long, ovate to ovate-lanceolate, base oblique, closely and often hoary tomentose on both surfaces, petioles clothed, as the leaves, 1–2 mm. long; ventral stipules mostly united, linear, hairy, to 1 mm. long, dorsal stipules distinct, linear, hairy, to 1 mm. long; peduncles less than 1 mm. long, with short appressed hairs; cyathia solitary at the nodes; involucres open-campanulate, 1.2–1.5 mm. diam., appressed-short-hairy without, glabrous within except below the glands; lobes narrowly deltoid, copiously hairy, equaling the glands; glands transversely oblong, dark reddish; appendages usually conspicuous, twice as wide as and longer than the glands to rarely wanting, white, margin crenate to subentire, glabrous or rarely with a few short hairs beneath next to the gland; fifth gland absent; sinus U-shaped, not depressed, densely hairy; bracteoles more or less completely united into an upwardly broadening, densely hairy, thickish, radial appendage adnate on the lower half to the involucre opposite each gland; staminate flowers 3–4 per fascicle, 15–20 per cyathium; androphores 1.5–2 mm. long, glabrous or rarely with short hairs above; gynophore shortly appressed-hairy, exserted and reflexed at maturity; ovary copiously hoary-tomentose, roundly three-lobed; styles parted nearly to the base, 0.5–0.8 mm. long, short-hairy below, slender throughout; capsule 1.5–1.7 mm. long, ovoid, sharply angled, very short-tomentose; seeds quadrangular, 1.2–1.5 mm. long, ca. 0.6 mm. radially and tangentially, facets smooth or slightly wrinkled, apex acutish, coat white, microreticulate.—Plate 663A.

Southern California, southern Arizona, northern Baja California including Guadalupe Island, Sonora (Map 12). Representative specimens seen: California. Los Angeles Co.: Verdugo Hills, *Abrams 1381* (NY); rocky slopes, San Gabriel Canyon, San Gabriel Mountains, *L. S. Rose 34521* (M, NY); Mt. Wilson Trail, San Gabriel Mountains, Apr. 5, 1933, *Steele & Pratt* (O);

slopes of Sierra Madre Canyon, San Gabriel Mountains, July 29, 1927, *Hastings* (NY); Lone Hill, near Glendora, *Munz & Eggleston 19622* (G). San Diego Co.: San Felipe Valley in Agave patches, *Reed 5833* (O); Yaqui Wells, Colorado Desert, *Eastwood 2773* (G, NY). Imperial Co.: 1 mile east of Mountain Springs, *Wiegand & Upton 3742* (G). ARIZONA. Yuma Co.: Mohawk Pass, *Lemmon 296* (G). Yavapai Co.: Copper Basin, *Toumey 251* (NY); on dry mesa, Big Bug, July 21, 1891, *Toumey* (US). Maricopa Co.: Agua Fria, *Coues & Ed. Palmer 264* (M); among the rocks, Canyon Lake, *A. Nelson 11216* (I); road banks along Apache Trail, west end of Canyon Lake, *A. & R. Nelson 1709* (M, NY). Pinal Co.: rocky south slopes, 5 miles west of Superior, *Maguire, Richards & Moeller 10263* (G, I); Oracle Ranger Station, Coronado Forest, *Eggleston 15967* (G, US). Pima Co.: La Osa, *Mearns 2688* (US); Canyon Diablo, Ajo Mountains, *Peebles & Kearney 10836* (US); Santa Catalina Mountains, *Shreve 5154* (G, US); Fresnal, *Thackery 83* (US). Gila Co.: Collom's camp at foot of Matzatzal Mountains, *A. & R. Nelson 1955* (G); Globe, *Kearney & Peebles 12060* (NY); rocky slopes of sandstone, Cassadore Spring Canyon, San Carlos Indian Reservation, *Maguire, Richards & Moeller 10301* (I); Collom Camp, Matzatzal Mountains, *Collom 33* (M, NY, US). Navajo Co.: Fort Apache, 1892, *Hoyt* (NY). Graham Co.: rocky soil, 12 miles east of Coolidge Dam, US Highway 180, *Maguire, Richards & Moeller 13024* (G, I). Cochise Co.: Pinery Creek, Chiricahua Mountains, Aug., 1896, *Fernow* (US). MEXICO. BAJA CALIFORNIA: sandy wash at junction of El Marmol and San Fernando Roads, 25 miles from El Marmol, *Wiggins 4357* (G, US); Lagoon Head, Mar. 6–15, 1889, *Ed. Palmer 783* (G, NY); near San Quentin Bay, *Orcutt 2196* (M); Jacumba, *Fisher 39* (US). SONORA: granitic hills 2 miles south of Sasabe, *Wiggins 5915* (US). For citation of additional specimens see Bull. Torr. Bot. Club. **63:** 438–9. 1936.

Jepson, Man. Fl. Pl. Calif., 600. 1925[1] includes under *Euphorbia polycarpa* var. *vestita* three entities, judging by the range given: *E. melanadenia* "Santa Monica; Glendora; Cahuenga Pass"; *E. polycarpa* var. *hirtella*, at least in part, "Colorado Desert"; *E. vallis-mortae*, "Inyo Co.". However, Jepson, Fl. Calif. **2:** 429. 1936, has the entities correctly delimited and named except that the proof of the statement that *E. melanadenia* occurs in "western Nevada" has yet to be supplied. I find neither explanation nor support for it in the *Euphorbiae* of Jepson's herbarium which he so kindly loaned to the Gray Herbarium for my use.

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[1] Title-page date questionable but here accepted as no question of priority is involved.

That the type of *E. melanadenia* did not come from "Low places near San Gabriel" is highly probable since this plant is confined to a narrow zone on the foot of the mountains in this region. Probably Bigelow collected it in the vicinity of Sierra Madre.

26. Euphorbia polycarpa Bentham, Bot. Voy. Sulphur, 50. 1844.

Perennial from a taproot slender or up to 6 mm. diam., prostrate or erect, sometimes forming a low rounded bush as much as 25 cm. high; stems very slender throughout or as much as 4 mm. diam. at base, sometimes zigzag, glabrous or with short spreading hairs, internodes mostly 1–2 cm. long, often much shorter upward; leaves glabrous or more or less pubescent, blades 1–10 mm. long, more or less oblique at base, orbicular to oblong-lanceolate, thin to thick, petioles clothed as the blades, 1–2 mm. long; ventral stipules united, ca. 0.5 mm. long, deltoid or rounded, ciliate or glabrous, dorsal stipules distinct, narrowly deltoid, ca. 0.5 mm. long, ciliate or sometimes glabrous; peduncles to 2 mm. long, glabrous or with short spreading hairs; involucres solitary at the nodes, distributed along the stem or more or less congested at the branch-tips, campanulate, 1–1.5 mm. in diam., glabrous or with short spreading hairs without, glabrous within except immediately below the glands, lobes narrowly deltoid to deltoid-attenuate, equaling or slightly exceeding the glands, short-hairy; glands maroon, transversely oblong, 0.5–0.75 mm. long; appendages up to three times as wide as the glands to absent, as long as or longer than the gland, white or reddish, entire or crenate, glabrous or with a few short hairs below on inner portion; fifth gland absent, its sinus U-shaped and not depressed, or V-shaped and slightly depressed; bracteoles forming a radial appendage opposite each gland, united to the involucre on lower half, linear, tapering upward, entire, or broader, with 2–5 divisions above, short-hairy above; staminate flowers 15–32 per cyathium; androphores 1–1.5 mm. long, glabrous or rarely short-hairy above; gynophore glabrous or short-hairy above, exserted and reflexed at maturity; ovary glabrous or densely pubescent, three-lobed; style bifid, 0.3–0.5 mm. long, glabrous or short-hairy below, clavate or slender above; capsule sharply 3-angled, glabrous or pubescent, spheroid, 1.1–1.3 mm. diam.; seeds quadrangular, 1–1.3 mm. long, ovate in radial outline, 0.5–0.6 mm. radially and tangentially, apex acutish, base truncate or obtuse, angles sharp, back curved, raphe straight, micropylar area slightly truncated, facets smooth or slightly wrinkled, plane or concave, the back facets lower than the angles, i. e., slightly depressed, coat micro-reticulate, white, opaque, or so thin that the brown testa shows through.

KEY TO VARIETIES

Appendages present, petioles ca. ¼ as long as leaves.
  Appendages wide to narrow and herbage usually essentially glabrous . . . . a. var. *typica*.
  Appendages narrow and herbage pubescent . . . . b. var. *hirtella*.
Appendages absent, petioles ca. ½ as long as leaves . . . . c. var. *simulans*.

26a. E. POLYCARPA Bentham, Bot. Voy. Sulphur, 50. 1844, var. TYPICA L. C. Wheeler, Bull. Torr. Bot. Club **63:** 408. 1936. TYPE: Bay of Magdalena, Lower California, Mexico, 1841, *Hines* (K!; photographs G!, W!; fragment F!). Boissier in DC. Prod. **15** (**2**): 44. 1862; Jepson, Man. Fl. Pl. Calif., 600, fig. 593. 1925;—*Chamaesyce polycarpa* (Benth.) Millsp. ex Parish, Cat. Pl. Salton Sink, 6. 1913 (preprint from Carn. Inst. Wash. Pub. **193:** 110. 1914.)—PLATE 657D.

California and Nevada, south to Lower California and Sonora (MAP 4). Representative specimens seen: CALIFORNIA. Los Angeles Co.: Eagle Rock foothills, *Rockwell 300* (J). San Bernardino Co.: the Needles, *M. E. Jones 5178* (I, O); Dunes, Needles, *Parish 9608* (G, M). Riverside Co.: Elsinore, Apr. 1892, *McClatchie* (NY); slopes of Box Springs Mountains, Riverside, Nov. 12, 1919, *Barrus 7* (O); between Cottonwood Mountains and Mecca, *McKelvey 5038* (G); near Desert Center, *M. E. Jones 24860* (G). San Diego Co.: San Diego, *Brandegee 615* (G, NY); Sweetwater valley, Apr. 30, 1883, *G. C. Deane* (G); Yaqui Wells, Colorado Desert, *Eastwood 2766* (G); near Sentenac Canyon, *Jepson 12475* (J); Escondido, *Meyer 230* (J); Del Mar grade from La Jolla, *Newlon 312* (J). NEVADA: 8 miles above Rioville, *M. E. Jones 5035* (M); Virgin River, *Goodding 708* (G). ARIZONA. Yavapai Co.: Castle Creek, *Toumey 263* (US). Yuma Co.: east of Blythe, *M. E. Jones 24877* (G, NY); Quartzsite, *M. E. Jones 24878* (G, NY); near Quartzsite, Sept. 20, 1934, *Kearney & Peebles* (US); Yuma, Apr. 21, 1913, *Wooton* (US). Maricopa Co.: Phoenix, June 20, 1891, *Dewey* (US); near Tempe, *Gillespie 8415* (US); Black Canyon Road, 23 miles north of Phoenix, *Gillespie 8666* (US); Hyder, *Peebles 6420* (US); near Phoenix, *Peebles, Harrison & Kearney 2461* (US); 5 miles east of Gila Bend, *Wolf 2300* (G). Pima Co.: north of mouth of Sabino Canyon, *Shreve 5354* (US); foothills of Santa Catalina Mountains, Apr. 8, 1884, *Pringle* (US). For citation of additional specimens see Bull. Torr. Bot. Club **63:** 408. 1936.

26b. E. POLYCARPA Bentham var. HIRTELLA Boiss. in DC. Prod. **15** (**2**): 44. 1862. TYPE: California, *Emory* (Gc; fragment F!)—*Chamaesyce polycarpa* var. *hirtella* (Boiss.) Millsp. ex Parish, Cat. Pl. Salton Sink, 6. 1913 (preprint from Carn. Inst. Wash. Pub. **193:** 110. 1914)—*C. tonsita* Millsp., Field Mus. Pub. Bot. **2:** 412. 1916.

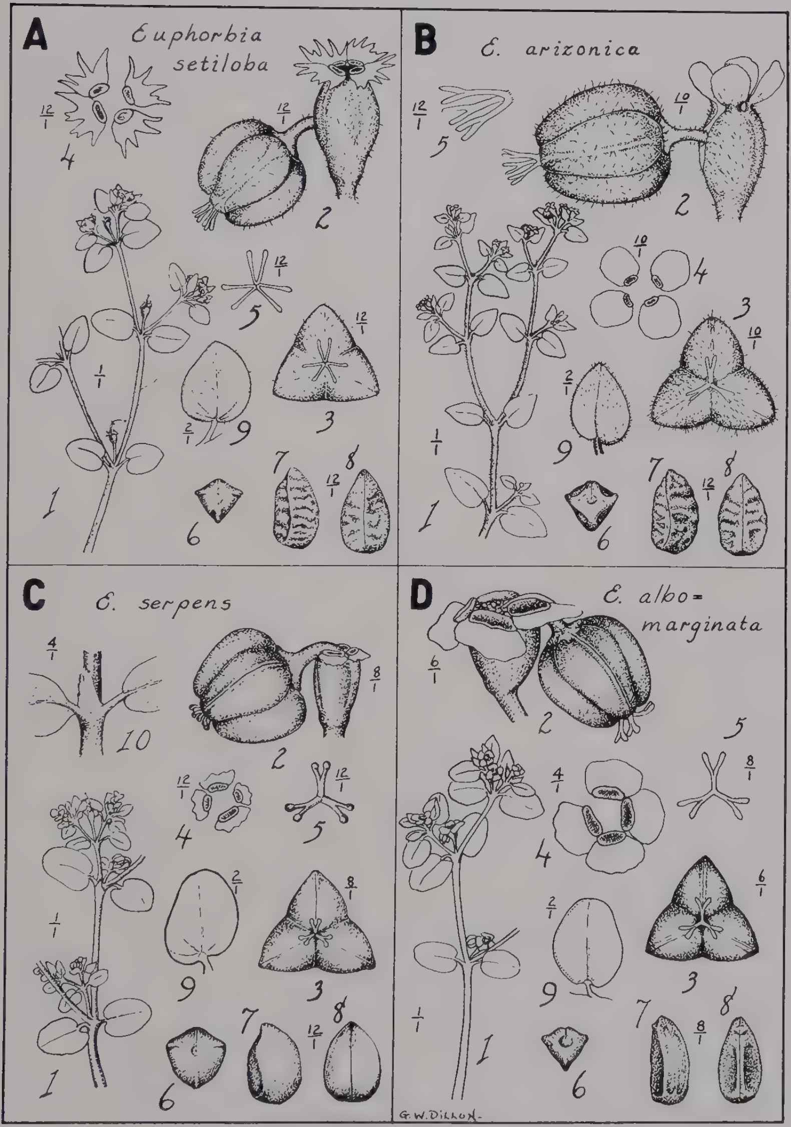
Deserts of California and southern Nevada, south to lower

California and Sonora (Map 3). Representative specimens seen: California. San Bernardino Co.: Soda Lake Mountains near Baker road station, May 30, 1931, *Beal* (J); Twenty-nine Palms, Colorado Desert, *Jepson 5964* (J). Riverside Co.: Devil's Canyon, Santa Rosa Mountains, Coachella Valley, *Clary 655* (J); Palm Canyon and return to Van Deventer's, *Jepson 1374* (J); Palm Springs, Colorado Desert, Apr. 18, 1921, *Spencer* (O); Palm Canyon, *Johnston 1050* (US); mouth of Palm Canyon, Borego Valley, *Duran 3176* (G, I, O); Signal Mountain, Colorado Desert, *Abrams 3187* (G). Imperial Co.: upper end of Painted Gorge, Carisso Mountains, *Ferris & Rossbach 9605* (G). Nevada: the Muddy Range, *Goodding 2222* (G). Yuma Co.: Yuma, Feb., 1881, *Vasey* (US); Yuma, Nov. 6, 1909, *Mowry* (US); Aztec, *Harrison 3563* (US). A collection differing in having the appendages almost twice as wide as the glands and deeply parted into several segments is possibly worth varietal recognition but is tentatively referred here until seeds, which were lacking, can be had: in rock crevices, Orocopia Mts. south of Hayfield's Reservoir, Riverside Co., California, alt. 1400 ft., Dec. 3, 1939, *Jaeger* (W).

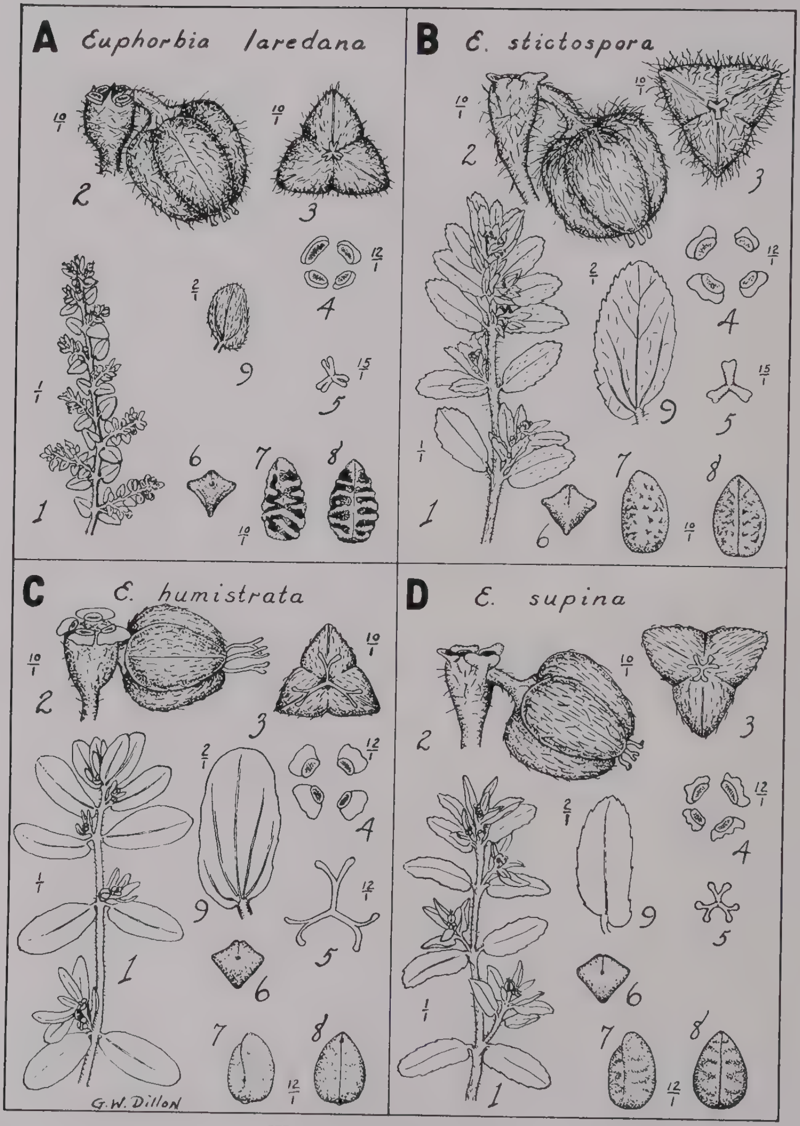
26c. E. polycarpa Bentham var. **simulans** var. nov. Glabra; petiolus limbo ca. duplo brevior; glandulae exappendiculatae.

Type: dry hillside near the Rio Grande, mouth of Santa Helena Canyon, Big Bend State Park, Brewster County, Texas, alt. 2,100 feet, Sept. 6, 1938, *Rollins & Chambers 2770* (G!). Additional specimens seen: Texas. Brewster Co.: frequent in stream-bed 2 miles east of Castolon, Mar. 4, 1937, *Cutler 723* (G); Castolon, May 5, 1928, *Cory 1927* (G); Santa Helena Canyon, Oct. 21, 1937, *Cory 26452* (G); common, sandy soil in valleys, Boquillas, Aug. 3, 1919, *Hanson 714* (G, US); mouth of Santa Helena Canyon, Aug. 8, 1938, *Warnock C506*, in part (US); near Chisos Mountains, *Young 139* (M); between Goat and Trap Mountains, *E. J. Palmer 34207* (NY); near San Vincente, *Sperry 1358* (US); Santa Helena Canyon, June 7, 1937, *Warnock 985* (US). Presidio Co.: Presidio, Sept. 27, 1937, *Warnock T95* (US). (Map 5).

27. Euphorbia Parishii Greene, Bull. Calif. Acad. **2:** 56. 1886. Type: Warm Springs, Mohave Desert, San Bernardino County, California, May, 1882, *S. B. & W. F. Parish 1384* (probably lost when the herbarium of California Academy burned in 1906, for Dr. Theodor Just states in letter of Feb. 25, 1939, filed at Gray Herbarium, that there is only a fragment in Herbarium Greeneanum at Notre Dame University; isotypes D!, M!, NY!).—*Chamaesyce Parishii* (Greene) Millsp. ex Parish, Cat. Pl. Salton Sink, 6. 1913, preprint from Carn. Inst. Wash. Pub. **193:** 110. 1914.—*E. polycarpa* Bentham var. *Parishii* (Greene) Jepson, Fl. Calif. **2:** 429. 1936.



WHEELER ON EUPHORBIA



Wheeler on Euphorbia

E. patellifera J. T. Howell, Leafl. West. Bot. **1**: 53. 1933. TYPE: Palm Wash, western Colorado Desert, San Diego County, California, *J. T. Howell 3488* (CA!; ISOTYPE F!).

Perennial, forming prostrate mats 20–50 cm. across, or a low bush 15–20 cm. high; stems slightly woody below in age, slender, glabrous, internodes 5–15 mm. long; leaf-blades mostly ovate, 2–4 mm. long, entire, glabrous, or very rarely tomentulose beneath, base oblique, apex mucronulate, midrib evident at least in lower half of blade; petioles 0.5–1 mm. long, glabrous, amplexicaul on ventral side of stem; upper stipules distinct, mostly entire, ciliate, broadly linear, 1 mm. long, lower stipules often more or less united, ciliate, linear, 1 mm. long; peduncles up to 1 mm. long, glabrous; cyathia solitary at the nodes; involucre campanulate, tapering to the peduncle, 1–1.2 mm. diam., glabrous without, with many short hairs within above; lobes broadly deltoid, mostly dentate, ciliate on inner face, equaling the glands; glands discoid, ca. 0.5 mm. diam., pale yellow or reddish, on stipes ca. half as wide as the gland; stipes ciliate on inner side; appendages absent; fifth gland ciliate on inner side, linear, mostly shorter than the lobes; sinus U-shaped, not depressed; bracteoles united for half their length, forming a membranous radial appendage ca. 1.3 mm. long, adnate for half its length to the involucre opposite each gland, glabrous below, ciliate above; staminate flowers 8–10 per fascicle, 40–50 per involucre; androphores glabrous, ca. 1.5 mm. long, slightly exserted at maturity; gynophore glabrous, long-exserted and usually reflexed at maturity; ovary glabrous, three-angled; styles ca. 0.5 mm. long, bifid to the middle, glabrous; capsule glabrous, sharply three-angled, oblate-spheroid, ca. 1.75 mm. long; seeds ca. 1.5 mm. long, ca. 0.75 mm. tangentially, ca. 0.65 mm. radially, quadrangular, long-ovate in radial outline, raphe straight, slightly truncated above, back sharply angled, facets faintly wrinkled, coat white, microreticulate.—PLATE 658B.

Deserts of Inyo, Kern, San Bernardino, Riverside, and San Diego Counties, California, east to Nevada (MAP 25). Representative specimens seen: CALIFORNIA. Inyo Co.: Furnace Creek Ranch, Death Valley, Apr. 30, 1917, alt. to 100 ft., *W. L. Jepson* (J); Stove Pipe Wells, Death Valley, *P. A. Munz & C. L. Hitchcock 11032* (P); near Triangle Spring, Death Valley, growing in dense brown mats on pebbly wash-fan, Apr. 17, 1917, *J. Grinnell* (J); Surprise Canyon, *S. B. Parish 10217* (C, J); Emigrant Canyon, Panamint Mountains, *R. S. Ferris, F. M. Scott & R. Bacigalupi 3998* (D); Emigrant Springs, *S. B. Parish 10190* (C, J); Greenwater Flat, *S. B. Parish 10138* (C). San Bernardino Co.: Baxter, Mohave Desert, *S. B. Parish 9882* (C); Ludlow, Mohave Desert, 1926, *M. E. Jones* (P). NEVADA. Lincoln Co.: Muddy Valley, alt. 1,700 ft., *Kennedy & Goodding 77* (NY, US).

For citation of additional specimens see Bull. Torr. Bot. Club **63:** 406. 1936.

28. Euphorbia micromera Boiss. ex Engelm., Proc. Amer. Acad. Arts & Sci. **5:** 171. 1861; Boiss. in DC. Prod. **15 (2):** 44. 1862. Type: bed of a creek descending to the San Pedro River, Cochise County, Arizona, Sept. 8, 1851, *C. Wright 1854* (M 149918!; photographs G!, W!, isotypes F!, G!, Ge!). Small and essentially glabrous, a good representative of the species.—*E. polycarpa* Bentham var. *micromera* Millsp. ex Orcutt, West Amer. Scientist **10:** 134. 1901; with neither basinym nor description, identity inferred from the coincidence of names.—*Chamaesyce micromera* (Boiss.) Wooton & Standley, Contr. U. S. Nat. Herb. **16:** 144. 1913.

E. pseudoserpyllifolia Millsp., Pittonia **2:** 87. 1890. Type: Bowie, Cochise County, Arizona, Sept. 15, 1884, *M. E. Jones 4223* (F 196599!; photographs G!, W!, isotypes G!, I!, P!, US!). Differing little from the type of *E. micromera* which was not considered.—*Chamaesyce pseudoserpyllifolia* (Millsp.) Millsp., Field Mus. Pub. Bot. **2:** 411. 1916.—*E. pseudoserpyllifolia* Millsp. forma *typica* J. T. Howell, Leafl. West. Bot. **1:** 52. 1933.

E. podagrica I. M. Johnston, Univ. Calif. Pub. Bot. **7:** 440. 1922. Type: washes at Gold Mountain, Esmeralda County, Nevada, 1898, *C. A. Purpus 6437* in part (C 110920!). Differing in no essential respect from the type of *E. micromera* which was not considered.

E. pseudoserpyllifolia Millsp. forma *villosa* J. T. Howell, Leafl. West. Bot. **1:** 53. 1933. Type: south of Palm Springs near Cathedral City, Riverside County, California, *J. T. Howell 6651* (CA 188849!). Differs from the type only in vestiture which is too variable to warrant recognition.

E. setiloba Engelm. var. *nodulosa* Jepson, Fl. Calif. **2:** 427. 1936. Type: between Brawley and Salton Sea, Colorado Desert, Imperial County, California, Oct. 15, 1912, 115 feet below sea level, *S. B. Parish 8301* (J!; photographs G!, W!; isotypes D!, F!, G!). This is the nodulose vestite variant local in the Colorado Desert. Some of the glands bear minute appendages. Possibly with more numerous collections this variant may prove itself worthy of recognition.

Prostrate annual: stems glabrous or pubescent, extremely variable, one extreme very straight, thick, with thickened nodes and internodes up to 1 cm. long, the other extreme flexuous or straightish, slender, nodes not thickened, internodes up to 2 cm. long; leaves glabrous or short-pubescent, blades 2–7 mm. long, ovate and base markedly oblique in the larger, oblong and base slightly oblique in the smaller, petioles ca. 0.5 mm. long; stipules ca. 0.7 mm. long, or shorter in pubescent plants, triangular, ciliate, upper distinct, lower often united toward stem-tip;

peduncles glabrous or pubescent, up to 1 mm. long; cyathia solitary in the axils; involucres ca. 0.9 mm. in diam., very short-campanulate, narrowed above, more or less cuneate to the peduncle, glabrous or pubescent without, glabrous within except the lobes, green-veined beneath the lobes; lobes deltoid, equaling or slightly exceeding the glands, hairy within; glands pink or red, strictly discoid or transversely oblong, especially the proximal, 0.1–0.15 mm. diam.; appendages absent or, in some pubescent and nodulose plants occasionally present as minute white margins; fifth gland absent; sinus broadly V-shaped, hairy, little depressed; bracteoles reduced to a solitary linear hairy appendage ca. 0.5 mm. long, adnate for most of its length to the involucre opposite the glands; staminate flowers 2–5 per involucre; androphores glabrous, included, 0.7–0.9 mm. long; gynophore glabrous throughout or short-hairy above, long-exserted and usually reflexed at maturity; ovary three-angled, glabrous to pubescent, carpels slightly grooved on the back; styles bifid, glabrous, ca. 0.2–0.3 mm. long, clavate; capsule three-angled, glabrous to pubescent, spheroid, ca. 1.3 mm. long; seeds quadrangular, 1.1–1.3 mm. long, 0.5 mm. tangentially, 0.4 mm. radially, narrowly ovate radially, angles sharp, facets smooth or with very faint wrinkles, convex, especially the front, base truncate, raphe straight or slightly concave, shortly truncate at a slight angle above, microreticulate white coat thin, with the brown of the testa showing through.—PLATE 658C.

Deserts from Inyo County south to Imperial County, California; Esmeralda and Clark Counties, Nevada; San Juan County, Utah; Arizona; Grant and Doña Ana Counties, New Mexico; Reeves and Brewster Counties, Texas; Chihuahua; and Coahuila and Peru (MAP 26). Representative specimens seen: CALIFORNIA. San Bernardino Co.: Daggett, Mohave Desert, Oct. 13, 1933, *Beal* (J). NEVADA: Clark Co.: near Boulder City, *Eastwood & Howell 6292* (G). UTAH: San Juan Co.: along San Juan River near Bluff, *Rydberg & Garrett 9896* (NY). ARIZONA: Yuma Co.: south of Quartzsite, *Kearney & Peebles 10219* (US); Mohawk, *Peebles, Harrison & Kearney 4976* (US). Pinal Co.: Sacaton, *Peebles 5000* (US). Pima Co.: Wilmot, on range reserve, *Thornber 341* (US). Gila Co.: Sierra Ancha, *Harrison & Kearney 8293* (US). Navajo Co.: Holbrook, Oct. 4, 1879, *Zuck* (NY, US in part). NEW MEXICO: Grant Co., gravel beds of the Gila River, *E. L. Greene 266* (M). Doña Ana Co.: Mesilla Valley, Oct. 5, 1899, *Wooton* (NY). TEXAS: Reeves Co.: *Cory 1959* (G). Brewster Co.: Persimmon Gap area, *Sperry 1464* (US). MEXICO: CHIHUAHUA: 3 miles north of Charco Piedra, *Johnston 7925* (G). COAHUILA: 3 miles south of Peña, *Johnston 7729* (G). For citation of additional specimens see Bull. Torr. Bot. Club **63:** 432–433. 1936.

This species is nowhere abundant and, while wide-ranging, occupies only scattered stations. Formerly, l. c., I included *Orcutt 1331* from Socorro, northern Baja California here. That collection, the basis of the *nomen nudum, Euphorbia baja californica* Millsp. ex Orcutt, West Amer. Scientist **10:** 134. 1901, differs in having styles ca. 0.6 mm. long and scarcely clavate; involucres ca. 1.1 mm. in diam.; staminate flowers 7–8; seeds strongly and irregularly ridged and glands often appendaged. (The specimen which is the type, if nomina nuda are worth typifying, is F 197073! for this came from Millspaugh's herbarium and is labeled "E. Baja-Californica sp. nov." There was some mistake made since the plants on the sheet are *E. cordifolia;* only the fragments in the pocket are the Lower Californian plant. Probably a mixture occurred during mounting.) This entity may be only worth varietal recognition, but, being extra-limital, is excluded here. Likewise *Ed. Palmer 789* (US), Baja California, Lagoon Head, is excluded as it seems to be the same as *Orcutt 1331.*

The reason that the specimen at M rather than the specimen at Ge is taken as type is that in the loan from Ge there is included only the merest fragment which is mislabeled as "*Fendler no. 1854*" when it should have been "*Wright no. 1854*". Furthermore the label accompanying this fragment bears no name. The piece sent may be a portion of Boissier's specimen but that is not certainly known. In view of the fact that Engelmann published the species first, attributing it to Boissier, and left a good specimen with a label bearing the name of the plant, it seems justifiable to take Engelmann's specimen as type.

The following new example of common identities between North and South America is to be noted: Shale cliff above sea, alt. 0–20 m., Paita, Dept. Piura, Peru, July 4, 1925, *F. W. Pennell 14815* (G).

29. Euphorbia cordifolia Elliott, Sketch Bot. So.-Car. & Georgia **2:** 656. 1824.[1] Type: "Grows in cultivated land, common around Beaufort [South Carolina] in dry soils." (Charleston, South Carolina, Museum).—*Chamaesyce cordifolia* (Ell.) Small, Fl. Se. U. S., 709, 1333. 1903.

Annual, glabrous; stems prostrate, or occasionally ascending in small plants, 4–35 cm. long, 0.5–2 mm. thick, internodes

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[1] See J. H. Barnhart, Dates of Elliott's Sketch, Bull. Torr. Bot. Club **28:** 680–688. 1901.

rarely up to 6 cm. long, mostly 2 cm. long or shorter; leaf-blades elliptic-orbicular to oblong and ovate-oblong, 4–12 mm. long, base more or less inequilateral, often cordate, margin entire; petioles ca. 1 mm. long; stipules parted to the base into few to several filiform segments up to 1.4 mm. long, mostly with short scattered hairs at least when young, dorsal distinct, ventral often united; peduncles 0.4–4 mm. long; cyathia solitary at the nodes and at the branch-tips but often congested by the marked shortening of the upper internodes; involucre broadly campanulate, 1.3–1.6 mm. in diam., glabrous outside, glabrous inside except at the base of the lobes and beneath the glands; lobes subulate, pubescent below, glabrous above, slightly exceeding the glands; glands transversely elliptical to oblong, often strongly folded, 0.5–0.9 mm. long; appendages from 1–3 times as wide as the gland, to 1.3 mm. wide, the wider radially broadly elliptical to reniform, glabrous, entire or with two or three low blunt teeth; fifth gland consisting of 1 or 2 linear filiform segments, glabrous above, equaling the lobes; sinus U-shaped, not depressed; bracteoles mostly united into a radial partition adnate for ca. half its length to the involucre, free portion parted into few to several linear pubescent segments, a few of the bracteoles entirely free; staminate flowers 9–44 per cyathium; androphores 1.2–1.6 mm. long, glabrous, or occasionally with a few short hairs above; gynophore glabrous or rarely pubescent below, exserted and reflexed; ovary glabrous, 3-angled; styles parted to the base, 0.6–0.9 mm. long; capsule glabrous, sharply 3-angled, wider below the equator, 1.7–2.1 mm. long; seeds ovoid-triangular, 1.2–1.5 mm. long, 0.7–0.9 mm. tangentially and radially, radially ovate to oblong-ovate, usually acute, or with low faint wrinkles, slightly concave to slightly convex, angles blunt, coat white, microreticulate, mostly so thin as to little obscure the pale, brown to gray testa.—PLATE 658A.

Mostly in sandy pine barrens, North Carolina to Florida, west to Texas (MAP 30). Representative specimens seen: NORTH CAROLINA. Pender Co.: Point Rock, Aug. ?, *Williamson* (NY). SOUTH CAROLINA: "Sand hills of S. C.". Oct. ?, *Ravenel* (G). GEORGIA. Richmond Co.: Augusta, Aug., 1902, *Anon.* (NY). Macon Co.: on site of Andersonville stockade, Sept. 5, 1897, *Harper* (NY). Dooly Co.: near Flint River, *Harper 574* (G, NY). Dougherty Co.: Albany, *Tracy 4710* (NY); pine barrens bordering the Altamaha River, *Curtiss 2469* (G, NY). FLORIDA. Lake Co.: near Eustis, *Nash 1070* (G, NY). Orange Co.: 1894. *Lewton* (NY). Polk Co.: Haines City, *Curtiss 5959* (G, NY). Hillsborough Co.: west coast, 1886, *Curtiss* (G). Walton Co.: summer, 1885, *Curtiss* (NY). Escambia Co., *Biltmore Herb. 5895*^{b} (NY). Suwanee Co.: 5 miles west of Live Oak, *Wiegand & Manning 1801* (G). Gilchrist Co.: Hammock along the Suwanee River east of Old Town, *J. K. Small, J. W. Small & DeWinkeler 11470* (NY). Mississippi. Jackson Co.: Horn Island, *Tracy 6370* (NY). Harrison Co.: Cat Island, *F. E. Lloyd & Tracy 208* (G, NY). Louisiana. Rapides Co.: Alexandria, *Hale* (NY). Texas. Tarrant Co.: in field, *Ruth 686* (NY). Medina Co.: 30 miles west of San Antonio, Sept., 1879, *Ed. Palmer 1212* (G). Hays Co.: San Marcos, *Stanfield* (NY). Colorado Co.: 6 miles northeast of Alleyton, *Cory 25096* (G). Walker Co.: near Huntsville, *Dixon 335* (G, NY). Waller Co.: Hempstead, *Hall 547* (G, NY). Jefferson Co.: Sabine Pass, July, 1884, *Neally* (G). Nueces Co.: near Corpus Christi, Mar., 1894, *Heller* (NY).

The type was recently examined by Professor Fernald who reports that it is identical with the usual interpretation of the species as exemplified by the two following collections from Georgia with which he compared it: *A. H. Curtiss 2469* (G); *R. M. Harper 574* (G).

There are two races of this species. This was discovered by the counts of the staminate flowers. In ten collections from west of the Mississippi River the number of staminate flowers per cyathium was 29–44; in ten collections from east of the Mississippi River the number per cyathium was 9–27. Having made this discovery a reexamination of the collections from these two areas was made in order to ascertain whether there were any more obvious differences between the two races. While there is a tendency in the eastern plants to have smaller leaves and shorter internodes there are too many exceptions to make any practical or certain division on these characters. Examination of a more ample suite of specimens would very likely produce intermediate numbers of staminate flowers. Since the species forms an acceptable unit as an undivided aggregate no attempt will be made here to further distinguish the two races.

Boissier in DC. Prod. **15** (**2**)**:** 30. 1862 identifies *Euphorbia ludoviciana* Raf., Fl. Ludovic., 111. 1817, with *E. cordifolia*. Since Rafinesque described his species as having leaves other than entire this identification must be erroneous.

30. Euphorbia serpens HBK., Nov. Gen. et Sp. **2:** 52 (quarto), 41 (folio). 1817.[1] Type: Cumana, Venezuela, *Bonpland 407* (Herb. Mus. Paris; photograph G! fragment F!).

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[1] See Barnhart, Bull. Torr. Bot. Club **29**: 585. 1902 as to date and for discussion of the quarto and folio editions.

Average as to habit and leaf-size, nodes rooting. Boissier in DC. Prod. **15** (**2**)**:** 29. 1862; Millsp., Bot. Gaz. **25:** 18. 1898, fifth gland broken in figure; Thellung, Bull. Herb. Boiss. ser. 2, **7:** 755. 1907; N. E. Brown in Thiselton-Dyer, Fl. Trop. Afr. **6** (**1**)**:** 511. 1911; Thellung in Ascherson & Graebner, Syn. Mitteleur. Fl. **7:** 440–443. 1917; L. C. Wheeler, Bull. So. Calif. Acad. Sci. **33:** 108. 1934.—*Anisophyllum serpens* (HBK.) Klotzsch & Garcke, Abh. Akad. Berlin, Phys. **1859:** 23. 1860.—*E. radicans* Moricand ex Klotzsch & Garcke, op. cit., 24, as synonym of *Anisophyllum serpens.*—*Chamaesyce serpens* (HBK.) Small, Fl. Se. U. S., 709, 1333. 1903.—*E. serpens* HBK. A *genuina* Thellung in Ascherson & Graebner, Syn. Mitteleur. Fl. **7:** 442. 1917.

E. herniaroides Nutt., Trans. Amer. Philos. Soc. n. s. **5:** 171. 1837. TYPE: Arkansas, probably *Nuttall* (PH!, or perhaps isotype?; photographs G!, W!).

E. flexicaulis Scheele, Linnaea **22:** 153. 1849. TYPE: "nordlich von Neubraunfels: Lindheimer. August." Comal County, Texas (?). Description places it here.—*E. serpens* HBK. var. *flexicaulis* (Scheele) Coulter, Contr. U. S. Nat. Herb. **2:** 388. 1894 (the available *E. serpens* var. *radicans* cited in synonymy). —*E. serpens* A *genuina* III *flexicaulis* (Scheele) Thellung in Ascherson & Graebner, Syn. Mitteleur. Fl. **7:** 442. 1917.

E. serpens var. *radicans* Engelm. ex Boiss. in DC. Prod. **15** (**2**)**:** 30. 1862. TYPE: Tampico, Mexico, *Berlandier 140* (Ge!; photographs G!, W!; ISOTYPE US 1169354!). Merely a vegetational phase with roots at some of the nodes.—*E. radicans* Moricand ex Boiss., l. c., as synonym of above name.—*Chamaesyce radicans* (Engelm.) Millsp., Field Mus. Pub. Bot. **2:** 411. 1916.

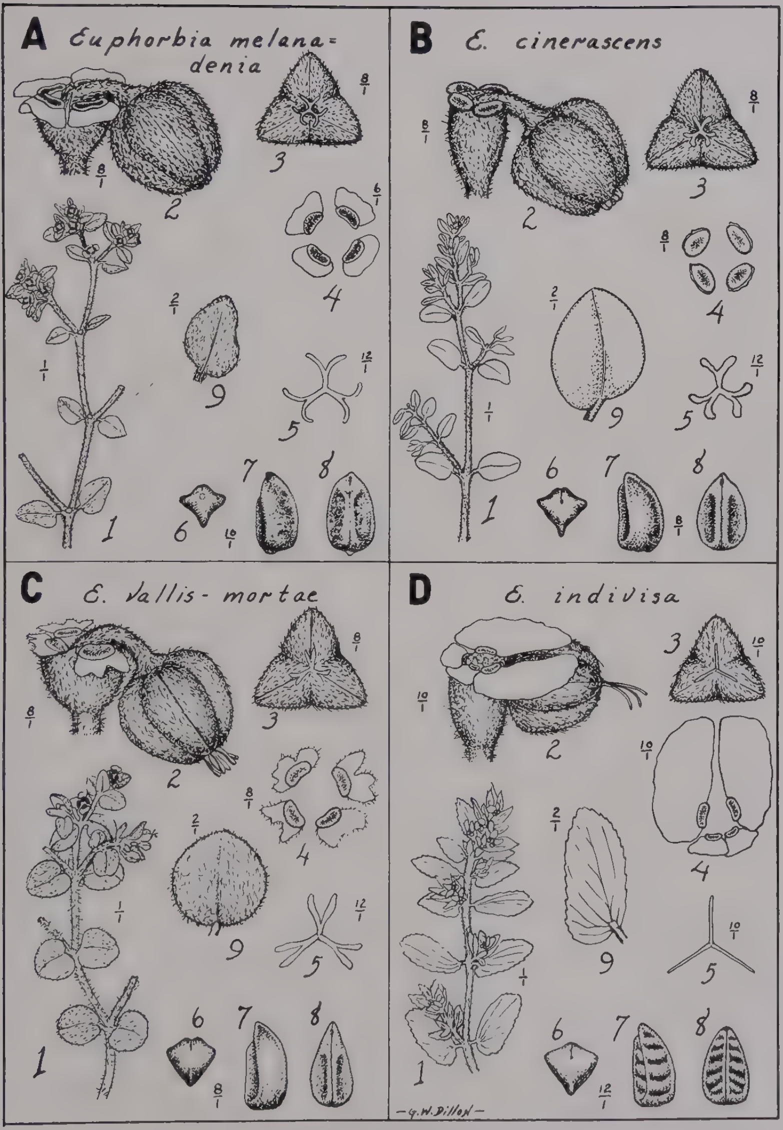
E. serpens var. *imbricata* Boiss. in DC. Prod. **15** (**2**)**:** 30. 1862. TYPE: Texas, *F. Lindheimer 693* (Ge!; photographs G!, W!). Internodes short and leaves thick, presumably due to a dry habitat. (This is the *Chamaesyce Hartwegiana* (Boiss.) Small *sensu* Small, Fl. Se. U. S. ed. 2, 1349. 1913).—*E.* "*herniaroides* Nutt. var. *imbricata*" Engelm. ex Blankinship, Ann. Rep. Mo. Bot. Gard. **18:** 149. 1907, as synonym of *E. serpens* HBK.; indexed in op. cit., **20:** 183. 1909. *E. serpens* A *genuina* II *imbricata* (Boiss.) Thellung in Ascherson & Graebner, Syn. Mitteleur. Fl. **7:** 442. 1917.

E. serpens A *genuina* III *flexicaulis* b *psilocyathia* Thellung, l. c. TYPE: Illinois (Zurich?). Referred here from the description.

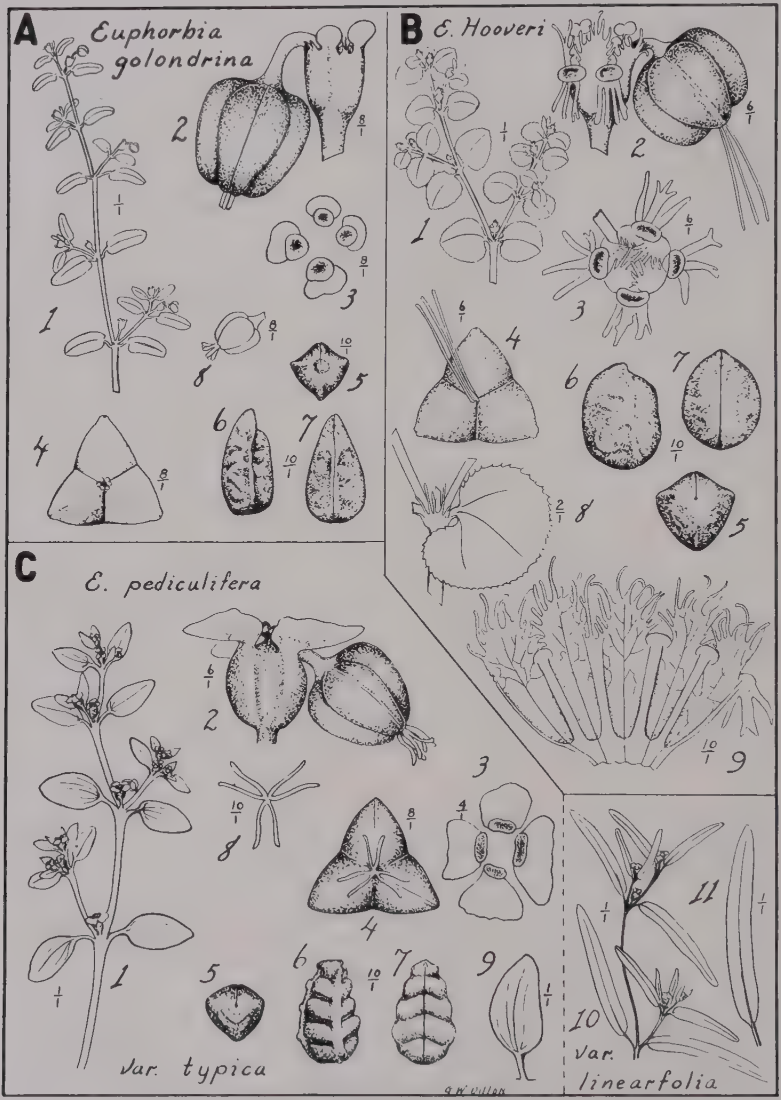
E. forbuserpens HBK. ex Wood & McCarthy, Journ. Elisha Mitchell Soc. **1885–6:** 119. 1886 (without description) is doubtless a *lapsus calami* for *E. serpens.*

Prostrate annual, often very leafy, herbage glabrous throughout; stems slender, up to 50 cm. long, internodes to 3 cm. long, nodes sometimes rooting; leaf-blades 2–7 mm. long, ovate-orbicular to oblong, base oblique except in the smallest, margin entire; petioles mostly less than 1 mm. long; both upper and lower stipules united into a white, membranous, glabrous scale less than 1 mm. long with more or less lacerate margin; peduncles up to 2 mm. long, expanding upward, glabrous; cyathia solitary at the nodes; involucres turbinate, 1 mm. long, 1 mm. diam., tapering to the thick upper end of the peduncle, glabrous without and within; lobes deltoid, sometimes with a few hairs on the margins below, apex acute to attenuate, equaling or slightly exceeding the glands; glands transversely oblong, ca. 0.2 mm. long, ochroleucous, concave; appendages mostly present, little wider than the glands, white, glabrous, margin mostly crenate; fifth gland linear, exceeding the glands, with a few marginal hairs at the base; sinus slightly depressed; bracteoles forming a single, linear or broader, entire or parted, slightly hairy appendage 0.6 mm. long or shorter, adnate below to the involucre opposite each gland; staminate flowers 5–10 per cyathium; androphores glabrous, 0.9–1 mm. long, equaling the glands; gynophore glabrous, exserted and mostly reflexed at maturity; ovary 3-lobed, glabrous; styles glabrous, markedly clavate, 0.2 mm. long, usually parted to below the middle, rotately spreading; capsule glabrous, 3-angled, ca. 1.2 mm. long; seeds smooth, ovoid with rounded angles or somewhat turgid-quadrangular with more prominent angles, ca. 1 mm. long, ca. 0.5 mm. radially and tangentially, coat microreticulate, white, with the brown testa showing through.—PLATE 661C.

Casual introduction in New Hampshire, New Jersey, Pennsylvania and probably Georgia; Ontario, Ohio, Indiana, Tennessee, Alabama and Florida, west to Arizona and New Mexico, north to Colorado and Montana, east to North Dakota, Iowa, and Illinois; south to South America, introduced in the Old World (MAP 37). Representative specimens seen from the United States and Canada: ONTARIO. Kent Co.: Chatham, *Macoun 5897* (NY, US). Middlesex Co.: London, June 9, 1883, *Burgess* (US). Windsor Co.: Windsor, Oct. 5, 1885, *Macoun* (G). NEW HAMPSHIRE: Belknap Co.: Gilmanton, 1867, *Blake* (US). NEW JERSEY. Co.?: on ballast sand, Petty's Island, Aug. 27, 1866, *Parker* (G, M). PENNSYLVANIA: Philadelphia Co.: Navy Yard, Philadelphia, Oct., 1865, *Burk* (PhB). OHIO. Sandusky Co.: Sandusky, Oct. 14, 1902, *Moseley* (US). INDIANA. Perry Co.: 5½ miles above Cannelton on Ohio River, *Deam 33357* (Deam, G). ILLINOIS. Fulton Co.: Canton, 1881, *Wolfe* (US). Menard Co.: Athens, Aug., 1886, *Hall* (US). St. Clair Co.: Cahokia, *Eggert* (NY). TENNESSEE. Davidson Co.: Nashville, Aug. 31, 1877, *Ward* (US). GEORGIA. Glynn Co.: waste places among rosin wharves, Brunswick, *Harper 1520* (G, NY, US). FLORIDA. Franklin Co.: Apalachicola, *Biltmore Herb. 3848a* (G, NY, US). ALABAMA. Hale Co.: Rosemary, *Harper 3248* (G, NY, US).



WHEELER on EUPHORBIA



WHEELER ON EUPHORBIA

Perry Co.: Uniontown, 1889, *Newman* (US). Mobile Co.: Mobile, July 14, 1891, *Mohr* (US). Mississippi. Lowndes Co.: Artesia, *Tracy 3125* (NY). Iowa. Webster Co.: *Somes 3841* (US). Woodbury Co.: Sioux City, *Pammel 192* (NY). Missouri. Jackson Co.: Courtney, *Bush 412* (NY, US). St. Clair Co.: 3½ miles north of Iconium on Osage River, *Steyermark 24316* (NY). Arkansas. Johnson Co.: Pine Bluff, *Demaree 8778* (NY, US). Pulaski Co.: Little Rock, *Coville 10* (US). Louisiana. Caddo Co.: Shreveport, *Cocks 3625* (NY). Orleans Co.: New Orleans, July, 1837, *Riddell & Carpenter* (US). Feliciana, *Carpenter* (US). North Dakota. Morton Co.: Glen Ullin, *Bergman 2411* (M). South Dakota. Mellette Co.: White River, *Over 6131* (US). Cheyenne River bottom, July 16, 1896, *Wallace* (NY). Indian Creek, Aug. 1891, *Williams* (US). Nebraska. Knox Co.: Niobrara, *Clements 2717* (G, NY, US). Lancaster Co.: Lincoln, Aug., 1898, *Williamson* (Ph). Kearney Co.: Minden, Sept. 18, 1929, *Hapeman* (Ph). Franklin Co.: Franklin, Aug. 25, 1929, *Hapeman* (Ph). Kansas. Ellis Co.: near Hays, *Rydberg & Imler 1193* (NY). Osborne Co.: Osborne City, *Shear 176* (G, NY, US). Riley Co.: *Norton 469* (G, NY, US). Saline Co.: Salina, *Mohr* (US). Douglas Co.: Lawrence, July, *W. C. Stevens* (US). Miami Co.: Aug. 10, 1885, *Oyster* (NY). Hamilton Co.: Syracuse, *Rose & Fitch 17011* (NY, US). Kiowa Co.: Belvidere, Sept. 26, 1897, *Ward* (US). Oklahoma. Woods Co.: Alva, *G. W. Stevens 1604* (G, NY, US). Kay Co.: Tonkawa, *G. W. Stevens 1863* (G, NY, US). Blaine Co.: Canton, *G. W. Stevens 834* (G, NY). Cleveland Co.: Norman, *Emig 527* (US). Texas. Austin Co.: Industry, 1846, *Lindheimer 300 Fasc. III* (US). Bexar Co.: near Bracken, *Groth 15* (G, US). Brazoria Co.: Columbia, *Bush 136* (NY). Cameron Co.: near Point Isabel, *Tharp 1180* (US): Dallas Co.: Dallas, *Stephenson 191* (US). Harris Co.: Hockley, *Thuron 4* (US). Howard Co.: Big Springs, *Tracy 8127* (Mo, NY, US). Jackson Co.: Carancahua Pt., *Tharp 1416* (US). Potter Co.: Amarillo, *Ball 1275* (US). Lubbock Co.: Lubbock, *Reed 3005* (US). Nueces Co.: Corpus Christi, *Heller 1463* (NY, US). Red River Co.: Clarksville, Sept. 25, 1894, *Plank* (NY). Starr Co.: 5 miles north of Rio Grande City, *Clover 1364* (NY). Tarrant Co.: Grapeland, *Tharp 881* (US). Taylor Co.: Abilene, *Tracy 7844* (Mo, NY, US). Travis Co.: near Austin, *Armer 5390* (US). Valverde Co.: bank of the Rio Grande, Del Rio, June 13, 1891, *Dewey* (US). Walker Co.: near Huntsville, *Dixon 376* (NY). Waller Co.: Hempstead, 1872, *Hall* (US). Webb Co.: Laredo, *Reverchon 3787* (G, US). Wharton Co.: Pierce, *Tracy 7435* (G, NY, US). Wilson Co.: Sutherland Springs, Aug. 22–30, 1879, *Ed. Palmer 1191* (G, US). Montana. Cascade Co.: Great Falls, *Williams 160* (US). Colorado. Weld Co.: New Windsor, Aug. 8, 1901, *Osterhout 2345* (NY).

New Mexico. Valencia Co.: near McArty's Ranch, *Rusby 378½* (M, NY). Chaves Co.: 20 miles south Rosswell, *F. S. & E. S. Earle 308* (M, NY, US). Eddy Co.: Carlsbad, *Tracy 8170* (NY, US). Doña Ana Co.: west of Organ Mountains, Aug. 26, 1899, *Wooton* (US). Arizona. Santa Cruz Co.: Santa Cruz River at La Noria, *Mearns 1192* (US). For citation of additional specimens see Bull. Torr. Bot. Club **63:** 448–9. 1936.

31. Euphorbia albomarginata T. & G., Rep. Expl. & Surv. Miss. R. to Pacific Ocean **2** (**4**): 174. 1855. Type: Rio Pecos, Texas, Nov. 1850, *Thurber 98* (NY!; photographs G!, W!; isotype G!). The common late-season phase with small leaves and short internodes. L. C. Wheeler, Bull. Torr. Bot. Club **63:** 446–7. 1936.—*E. stipulacea* Engelm. ex Boiss. in DC. Prod. **15** (**2**): 30. 1862, in synonymy.—*Anisophyllum albomarginatum* (T. & G.) Klotzsch & Garcke, Abh. Akad. Berlin, Phys. **1859:** 53. 1860.—*Chamaesyce albomarginata* (T. & G.) Small, Fl. Se. U. S., 710, 1333. 1903.

Glabrous prostrate perennial from a taproot woody in age; stems several to numerous, up to 40 cm. long, internodes up to 6 cm. long but usually much shorter, nodes often rooting; leaf-blades mostly 3–6 mm. long, sometimes as much as 15 mm. long, orbicular to oblong, sometimes with a red spot in the middle on the upper surface, midrib usually not prominent, lateral veins rarely evident, margin entire; petioles 0.5–1 mm. long; both upper and lower stipules united into a glabrous, white, membranous, deltoid to subulate, usually lacerate-margined scale; cyathia solitary at the nodes; peduncles slender, glabrous, mostly 2–4 mm. long; involucres 1.5–2 mm. diam., open-campanulate to broadly obconical, glabrous without and within except on the lobes; lobes short-hairy within below, exceeding the glands, narrowly deltoid-attenuate; glands 0.5–1 mm. long, transversely oblong, concave, ochroleucous or mostly maroon; appendages usually conspicuous, wider and longer than the glands, white, glabrous, entire or slightly crenate; fifth gland linear, equaling the lobes, hairy within below; sinus U-shaped, little depresssed; bracteoles forming one conspicuous, upwardly expanded, mostly 2–4-divided, hairy radial appendage two-thirds as long to as long as the androphores, adnate below to the involucre opposite each gland; staminate flowers 3–6 per fascicle, 15–30 per involucre; androphores 1–1.3 mm. long, glabrous; gynophore glabrous, long-exserted and mostly reflexed at maturity; ovary glabrous, three-lobed; styles bifid to below the middle, 0.5–0.7 mm. long, glabrous, clavate, spreading-erect; capsule sharply three-angled, glabrous, ovoid, 1.7–2.3 mm. long; seeds 1.2–1.7 mm. long, 0.7–0.8 mm. radially, 0.7–0.9 tangentially, quadrangular, narrowly oblong to oblong-ovate radially, base obtuse or truncate, facets concave or convex, smooth, angles mostly rounded, coat microreticulate in definite lines, opaque-white or so thin as to little obscure the brown testa.—PLATE 661D.

Southern San Joaquin Valley, Inyo Co., south through southern California, east to Nevada, Utah, Arizona, New Mexico, Texas and Oklahoma, south to Lower California, east to Tamaulipas (MAP 23). Representative specimens seen: CALIFORNIA. Tulare Co.: Porterville, Sept. 20, 1921, *Kelly* (CA). Kings-Tulare Co.: between Tulare and Tulare Lake, 1892, *Ed. Palmer 2721* (US). Kern Co.: Bakersfield, *Davy 1883* (C); Randsburg, Mohave Desert, Apr. 14, 1905, *Heller* (NY, Ph, US). Ventura Co.: near Frazier Borax Mine, Mt. Pinos, *Abrams & McGregor 206* (D, G, NY, US). Inyo Co.: Shepherd Canyon, Argus Mountains, *Coville & Funston 735* (G, NY). Los Angeles Co.: Santa Monica Hills, *G. B. Grant 427* (US); North Fork, San Gabriel, *Leiberg 3374* (US); San Bernardino Co.: Kessler Peak, Ivanpah Mountains, Mohave Desert, *Jepson 15829* (J); Holcomb Valley, San Bernardino Mountains, altitude 7,200 feet, *Ewan 4872* (G); Redlands, *Kuntze 23263* (NY); Hesperia, Mohave Desert, *Spencer 552* (G, NY). Riverside Co.: Paloverde, Colorado Desert, *Schellenger 78* (J); San Jacinto Valley, *Vasey 574* (US). San Diego Co.: head of Box Canyon near Mason Valley, *Duran 3205* (G, I, NY, O, US). Imperial Co.: on ditch banks, Experiment Farm, Bard, Apr. 5, 1912, *Dewey* (US); Fort Yuma, *Jepson 11734* (J). NEVADA. Nye Co.: Rhyolite, *Heller 9674* (G, US); gravel canyon-bottom, road to Beatty, east side Grapevine Mountains, Death Valley Region, *Train 676* (US). Clark Co.: Moapa, *Kennedy 1089* (NY, US); Kiernan's, Meadow Valley Wash, *Goodding 654* (NY, US); Mormon Mesa, *Eastwood & Howell 6310* (G); Las Vegas, *Goodding 2301* (G, NY). UTAH. Washington Co.: mesa northwest of Hurricane, *Maguire & Blood 1436* (I); near St. George, *Wann 27* (I). ARIZONA. Mohave Co.: plain near Oatman, April, 1916, *Creighton* (Ph); Peach Springs, April, 1893, *Wilson* (G). Coconino Co.: Turkey Tanks, *MacDougal 141* (G, US); north from San Francisco Peaks, *Leiberg 5573* (US). Navajo Co.: Winslow, 2 miles north in desert, *Stone 373* (NY); Pinedale, *Hough 126* (US). Apache Co.: between Chambers and Navajo, *Eastwood & Howell 6893* (G). Yavapai Co.: Prescott, Aug. 7, 1876, *Ed. Palmer 509* (G, US). Maricopa Co.: Hassayampa, *Newlon 584* (J). Pinal Co.: sandy river bottom, Gila River, 2 miles below Coolidge Dam, *Maguire, Richards & Moeller 10421* (G, I). Gila Co.: Roosevelt Dam, *Goodding 723* (G, NY, US). Greenlee Co.: face of conglomerate cliff above San Francisco River banks, S. Clifton, *Maguire, Richards & Moeller 11788* (G, I). Graham Co.: ¼ mile west Upper Reservoir Plat, 10 miles southwest Safford, *Maguire 10007* (I). Pima Co.: Santa Cruz Valley near Tucson, May 2, 1881, *Pringle* (G, NY, US); Tucson, Nov. 30, 1894, *Toumey* (G, NY, US). Santa Cruz Co.: vicinity of Ruby, *Mrs. A. F. Morton 88* (US). Cochise Co.: Tanner's Canyon, Huachuca Mountains, *Holzner 1573* (US); Paradise, *Blumer 1691* (G, NY, US); San Bernardino Ranch, Mex. Boundary Line, *Mearns 639* (NY, US). New Mexico: McKinley Co.: Ft. Wingate, *Rusby 380* (NY, US). Quay Co.: Tucumcari, red clay soil, *Fisher 74* (US). Socorro Co.: Magdalena to Water Canyon, *Eggleston 20227* (NY, US). Lincoln Co.: 4 miles above Tularosa, White Mountains, *Wooton & Standley 3617* (US). Chaves Co.: 20 miles south of Roswell, *F. S. & E. S. Earle 309* (NY, P, US). Sierra Co.: Lake Valley, Sept., 1914, *Beals* (US). Grant Co.: Mangas Springs, 18 miles northwest of Silver City, *Metcalfe 722* (G, NY, US); 5 miles east of junction of Mule Creek road, on Mule Creek Highway, *Maguire, Richards & Moeller 11918* (G, I). Luna Co.: Deming, *Evans 5* (NY); Carrizallilo Mountains, *Mearns 153* (US). Doña Ana Co.: mesa near Las Cruces, *Wooton 75* (NY, US). Eddy Co.: dry plains east of Carlsbad, *Standley 40295* (US). Oklahoma. Harmon Co.: field near Hollis, *G. W. Stevens 1105* (D, G, M, NY, US). Texas: Lubbock Co.: Lubbock, *Demaree 7525* (US). Hudspeth Co.: Rio Grande at Bosque Bonita Crossing, *Cory 1935* (G). Reeves Co.: Verhalen, *Cory 1926* (G). Ward Co.: Barstow, *Tracy 437* (G, Mo, NY, US). Jeff Davis Co.: Limpia Canyon, *Tharp 4427* (US). Presidio Co.: Shafter, infrequent, valleys, *Hanson 552* (NY, US). Brewster Co.: along Rio Grande near Lajitas, Chisos Mountain area, *Warnock 665* (US). Crockett Co.: Ozona, *M. E. Jones 26001* (I, W). Dallas Co.: Dallas, *Bush 650* (G, NY, US). Tom Green Co.: Knickerbocker Ranch, Dove Creek, *Tweedy 268* (US). Bexar Co.: San Antonio, dry rocky ground, *E. J. Palmer 33786* (NY, US). Wilson Co.: Sutherland Springs, Aug. 1879, *Ed. Palmer 1207* (G). Zavala Co.: Crystal City, *Hanson 685* (G, US). Duval Co.: San Diego, *Croft 202* (US). Starr Co.: Rio Grande City, *Neally 221* (US). Hidalgo Co.: Abrams, June 9, 1928, *Bogusch & Molby* (O). Cameron Co.: Kingsville, *Tracy 9125* (G, NY, US). Rio Hondo, *Chandler 7026* (G, NY, US). MEXICO: Baja California: between Ojos Negros and Neji Rancho, *Wiggins & Gillespie 4141* (G, NY, O, US); Gardner's Laguna, *Schoenfeldt 2896* (US). Sonora: dry reservoir, Alamo, west Magdalena, *Kennedy 7076* (US); 5 miles south of Nacori, *Lloyd 458* (G); Arroyo de Cocoragua south of Velderrain, *Pennell 19477* (US); Alamos, arroyo, *Rose, Standley & Russell 12935* (US); Magdalena, *Rose, Standley & Russell 15074* (NY, US). Sinaloa: Culiacan, *Rose, Standley & Russell 14934* (NY, US). Chihuahua: Rio Santa Maria, *Thurber 749* (G, NY); 6 miles west of Piloncillo, *Johnston 7862* (G); Casas Grandes, *Goldman 406* (G, US); near Chihuahua, Apr. 8–27, 1908, *Ed. Palmer 15* (G, NY, US); Llano de Chilicote, 7 miles east of Chilocote Station, *Johnston 7991* (G); Santo

Tomas on railroad northwest of San Isidro, Sierra Madre Occidental, *Pennell 18991* (US). DURANGO: Durango and vicinity, June, 1896, *Ed. Palmer 296* (C, F, G); Santiago Papasquiaro, Apr., 1896, *Ed. Palmer 42* (C, F, G, US). COAHUILA: Municipio de Muzquiz, Hacienda Mariposa, open brush land near Puerto Santa Ana, *Wynd & Mueller 274* (G, NY, US). NUEVO LEON: Monterey, *Dodge 83* (US). TAMAULIPAS: Victoria, Feb. 1 to Apr. 9, 1907, *Ed. Palmer 92* (US). For citation of additional collections see Bull. Torr. Bot. Club **63:** 446–447. 1936.

The Thurber specimen here taken as type is from Torrey's herbarium and is labeled "*Euphorbia albomarginata* Torr. & Gray" presumably in Torrey's hand. This specimen is accompanied by diagnostic drawings. This choice of type preserves the customary interpretation of this well known species. The original diagnosis would not distinguish *E. Fendleri* nor *E. polycarpa* from *E. albomarginata.* However, in spite of that and the fact that some specimens of *E. Fendleri* were labeled as *E. albomarginata* and the description of the seeds was probably drawn from them, the majority of specimens originally referred to *E. albomarginata* were that, and *E. Fendleri* was described on the next page. One specimen of *E. polycarpa* was included in the concept and part of the original diagnosis may have been based upon it. Nevertheless, about three-fourths of the specimens originally referred to *E. albomarginata* were specifically identical with the specimen here chosen as type.

Jepson's statement, Fl. Calif. **2**: 428. 1936: "type loc. 'headwaters of the Colorado,' that is, western Texas, *Diffenderfer;*" is based on the statement in the publication of *E. albomarginata* that it grew "with the preceding" (*E. Wrightii* T. & G.) which is reported from "Headwaters of the Colorado". This, combined with the statement on page 3 of the same volume that all the collections of plants of the expedition were made by Dr. W. L. Diffenderfer leads logically to Jepson's bibliographical conclusion. My selection is based on actual examination of the specimens from which the original diagnosis was drawn.

(*To be continued*)

OBSERVATIONS IN 1940 ON THE DISSEMINATION BY ANTS OF THE SEEDS OF TRILLIUM GRANDIFLORUM

Burton N. Gates

It has been possible to confirm in 1940, the observations made in 1939,[1] on the behavior of ants in the dissemination of seeds of *Trillium grandiflorum* Salisb. It was also determined that at least five ant species perform this dissemination.

In 1940, a populous, subterranean colony of *Formica neogogates* var. had established themselves in the lawn, about five feet from the group of *Trillium* plants. Before the *Trillium* seeds had ripened, July 19, 1940, ants from the nest were seen exploring the plants. As soon as ripe seeds were available, ants from this nest were tested to determine whether they would carry off seeds to their nest. To each of five ants, a freshly gathered *Trillium* seed was offered; each ant picked up the seed and carried it off in the direction of the nest. Each of these five ants was captured for the purpose of identification; each was identified[2] as the same species, *Formica neogogates* var. A sixth ant (not captured) was permitted to carry a fresh *Trillium* seed into the *Formica* nest.

It was presumed in 1939, that the ants not only ate the caruncle, but that they also gathered for food the pulp which surrounds the seeds in the capsule. In 1940, ants from the *Formica* nest were observed removing the fleshy pulp from the capsule; one ant carrying a fragment of pulp was traced to the nest.

As in 1939, a number of seed capsules which had been emptied, leaving only the thin shell of the capsule, were found beneath the plants. A ripe capsule which had just fallen was also watched. This soon became covered with the *Formica* ants, busy removing the seeds and pulp from the end which had broken away from the plant.

Although a considerable number of the *Trillium* seeds must have been carried into the *Formica* nest in the lawn, the presence of the grass around this nest made it most difficult to find any seeds which the ants had brought out of nest, after the caruncle had been eaten off. Moreover, during the observations, there were numerous rains, some heavy, which may have washed away or covered discarded seeds. In contrast to the seventy seeds collected in and about the stone-pile ant nest in 1939, only two seeds could be found in 1940 which had been brought out of the *Formica* nest and dropped between the tufts of grass. These two, however, upon examination with a lens showed clearly the roughened surface close to the seed coat, where the caruncle had been gnawed away, without doubt for food. This indicates that the habit of finally casting out from the nest, the seeds from which the caruncle has been gnawed is relatively a constant behavior.

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[1] Rhodora, vol. 42, number 497, page 194.

[2] All ant identifications were made by Mr. Lawrence G. Wesson, Boston, Mass., whose courtesy is greatly appreciated.

It was desirable to determine to what extent the *Trillium* seeds might be gathered by ant species other than *Formica neogogates* var. For this purpose some freshly gathered seeds were taken to another part of the grounds, at least one hundred feet from the group of plants. A seed was offered indiscriminately to any ant seen. If the ant picked up the seed and started off with it, that ant was collected for identification. Five ants responded and picked up the seed; none refused. Moreover, some ants too small to carry a seed, climbed upon it and apparently gnawed at the caruncle. Presumably, a considerable number of ant species, in the locality where *Trillium grandiflorum* grows, participate in the dissemination of the seeds.

The identifications by Mr. Wesson of ants tested at random, are:

1. A small specimen (brownish), *Lasius niger* var. *americanus*.
2. A larger ant (brownish), *Myrmica fracticornis*.
3. Two large black specimens. *Formica fusca subsericea*.
4. Large ant (black), *Camponotus herculeanus pennsylvanicus*.

DEPARTMENT OF AGRICULTURE,
State House, Boston

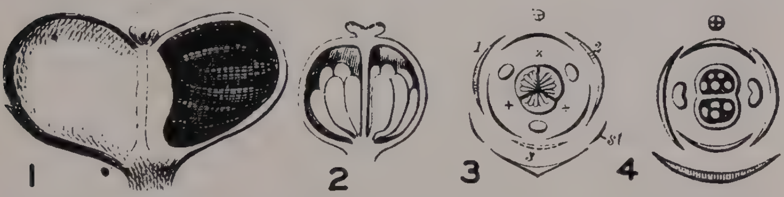
VICIA LATHYROIDES IN EASTERN VIRGINIA AND NEW TO NORTH AMERICA.—On March 30, 1937, while in Middlesex County, Virginia an occasion arose for an early-season field-trip into the region around Deltaville. The area is the tip of a small peninsula between the Rappahannock and the Piankatank Rivers, at the point where they empty into the Chesapeake Bay. The soil is sand of the lower coastal terrace. Matted in the sand along the inner beach at Stingrey Point was found a small *Vicia*-like plant without flower or fruit. Specimens were taken and attempts at determination were unsuccessful. Handling of sheets of undetermined material recently brought these specimens to attention again. Some of them were sent to Mr. Robert F. Martin, of the Bureau of Plant Industry, Washington, D. C., for comparing with herbarium material. He has determined it as *Vicia lathyroides* L., a European species apparently not previously reported in North America. Professor Fernald informs me, however, that there is flowering and fruiting material in the Gray Herbarium, collected on May 21, 1931 and again in May, 1933 on Nantucket Island, Massachusetts, by Mr. and Mrs. Alfred F. Shurrocks, who wrote of it: "there are carpets, covering acres. . . . It also covers large portions of a field—an old barn lot— . . . and in scattering quantities in other fields." Sheets of the Virginia material have been placed in the Herbarium of the National Arboretum and in the Gray Herbarium.

The species will be studied more closely in the field during 1941 and carefully compared with European material.—A. B. MASSEY, Virginia Polytechnic Institute, Blacksburg, Virginia.

ELATINE AMERICANA AND E. TRIANDRA

M. L. FERNALD

The eastern North American *Elatine americana* (Pursh) Arn. has been generally recognized as an endemic species—by Pursh, Arnott, Torrey & Gray, Seubert, Fenzl and others. The habitally similar *E. minima* (Nutt.) Fisch. & Meyer was long confused with it, but in RHODORA, xix. 12 and 13 (1917), I pointed out the differences between them. Subsequently, Fassett, in RHODORA, xxxiii. 72 (1931), has differed from me, in treating *E. americana* as a variety of the largely Old World *E. triandra* Schkuhr and he has reaffirmed this opinion in vol. xli. 373 (1939). His reasoning, as stated in 1931, was, that in its terrestrial state *E. triandra* simulates *E. americana* which has only the terrestrial state and, although in deep water *E. triandra* elongates, like the aquatic species of *Callitriche,* while *E. americana* does not do so, "an aquatic state like [*E. triandra*] forma *callitrichoides* should be sought in *E. americana*." Furthermore, Fassett felt that "The lack of an elongate aquatic form of the estuarine plant [*E. americana*] has a parallel in the case of *Eriocaulon. E*[*riocaulon*]. *septangulare,* growing sometimes in as much as 2 m. of water, produces elongate scapes raising the heads to the surface. But the doubtfully distinct *E*[*riocaulon*]. *Parkeri* of estuaries, alternately deeply submerged and left stranded on the mud, remains short and stocky like the *E. septangulare* found on the shore." Further assumed parallelisms were given by Fassett, one of them leading him to the conclusion that "*E*[*latine*]. *triandra* . . . var. *americana* has somewhat the relation to *E. triandra* that *Limosella subulata* has to *L. aquatica*."



ELATINE TRIANDRA: FIG. 1, vertical section of fruit, after *Seubert;* FIG. 3, horizontal section of flower, after *Eichler.*

E. MINIMA (with seed attached much as in E. AMERICANA): FIG. 2, vertical section of fruit, after *Gray;* FIG. 4, horizontal section of flower, after *Eichler* (copied from *Gray*).

Since I have not been able to follow Fassett in reducing *Elatine americana* to varietal rank under *E. triandra* and have, consequently, been several times challenged and tacitly reproved for holding to my earlier decision, in keeping *E. americana* apart, it becomes necessary, in the interest of exact taxonomy, to state my reasons. So far as I can detect Fassett has not discussed the fundamental differences in position of ovules and seeds, so clearly understood by Nuttall, Eichler, Asa Gray and others, which seem to me far more significant than variations of leaf-outline. *E. triandra,* as beautifully shown by Seubert in his *Elatinarum Monographia* in Acad. Caes. Leop. Nova Acta, xxi. t. II. fig. 6 (1845), here reproduced as FIGURE 1, has the seeds borne the whole length of the central axis and horizontally divergent; whereas the seeds of the American *E. americana* and

E. minima are borne at the base of the central axis and stand vertically. This fundamental morphological difference has been recognized by most students of the group since Nuttall published the genus *Crypta* in Journ. Acad. Nat. Sci. Phila. i. 117 (1817), based upon *C. minima* Nutt. (*Elatine minima*) of which he gave a most detailed analysis, including "seeds attached to a small basilar and common receptacle". Gray, Gen. Pl. U. S. Ill. i. 219 (1848), set up for *E. americana* (in which he included *Crypta minima*) the subgenus *Crypta* (Nutt.) Gray, with "Placentae basilares, oligospermae . . . a basilar placenta bearing 6 to 12 erect seeds". In the same work subgenus *Crypta* was illustrated by Sprague's drawings of details of *E. minima,* the type of the subgenus, in plate 95. Sprague's drawing of the basally attached and erect seeds, such as can be seen by slight magnification in fruit of *E. americana* and *E. minima,* is here reproduced as FIGURE 2, although Gray later wrote of this figure, "In good fruits, the seeds are rather more numerous . . . in insertion they are not so basal, yet all are ascending.[1] The contrast in position of the seeds in *E. triandra* on the one hand and *E. americana* and *E. minima* on the other was well brought out by Eichler, Blüthendiagramme, ii. fig. 95 C, of *E. triandra,* and fig. 96, of *E. minima* (1872). These diagrams, here reproduced as FIGURES 3 and 4, show in the ovary of *E. triandra* (viewed from above) the horizontally divergent ovules, in *E. minima* the vertical ones. Without enumerating all the careful studies of *Elatine* in which this fundamental morphological difference is brought out, it is sufficient to note that Gray regularly recognized it, saying in his treatment of *Elatine* in the Synoptical Flora of North America, 1^1. 281 (1897), under *E. triandra* "seeds ascending over the whole thickened axis of the capsule", under *E. americana* (including *minima*), "in aquatic form [i. e. *E. minima*] . . . ovules and seeds mainly basilar", "in terrestrial form [i. e. *E. americana*] . . . more axile". In Gray's Manual, ed. 7: 579 (1908) the same morphological difference was expressed under *E. americana* by "*seeds* . . . rising from the base", under *E. triandra* by "seeds . . . covering the axis." Reexamination convinces me that I am not in error in following Nuttall, Gray, Seubert, Eichler and many others in keeping *E. americana* apart from *E. triandra* and in following Gray in recognizing as a species *E. brachysperma* Gray.

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[1] Gray, *Elatines Americanae* in Proc. Am. Acad. xiii. 363 (1878), Gray here referring to fruiting *E. americana,* rather than *E. minima.*

In view of the implication that *Eriocaulon Parkeri* is "doubtfully distinct" from *E. septangulare*, it may be pointed out that I propose to use the following key-characters in the next edition of Gray's Manual.

E. SEPTANGULARE: mature heads depressed-globose, the abundant and crowded marginal flowers tending to push back and hide the involucre; chaff and flowers fringed by abundant, elongate white club-shaped trichomes; seeds subglobose, rarely globose-ellipsoid.

E. PARKERI: mature heads depressed-hemispherical, loosely few-flowered; involucre not reflexed nor hidden; chaff and flowers glabrous or nearly so; seeds ellipsoid, rarely subglobose.

In eastern Canada and the Atlantic States the ranges and habitats of *Eriocaulon Parkeri* and of *Elatine americana* largely coincide; in the same region *Elatine minima* is found within the broad range of and often associated with *Eriocaulon septangulare.*

GNAPHALIUM OBTUSIFOLIUM VAR. MICRADENIUM IN NEW HAMPSHIRE AND SOUTH CAROLINA.—It may be worth while to record, somewhat belatedly, the occurrence of *Gnaphalium obtusifolium* var. *micradenium* Weath. in New Hampshire. A small colony of it was found Sept. 2, 1936, during a field-trip of the New England Botanical Club, along a wood-road in dry sandy woods in the township of Ossipee. This station does not constitute an extension of range, the variety having been found by Fernald and Long in Limington, Maine, a few miles to the east. It is, however, so far as I know, the first record for New Hampshire. No other New England stations than these two are known to me north of Cape Cod.

Another collection has recently been received at the Gray Herbarium which does extend, southward, the range as given when the variety was published in RHODORA xxv. 22 (1923),—pine barren, near Pineville, Berkeley County, South Carolina, Sept. 11, 1939, *Godfrey* 8195. Messrs. Fernald and Long have added several localities in southeastern Virginia. Specimens from Pike County, Arkansas, *Demaree* 9373A, distributed as var. *micradenium*, are var. *Helleri* (Britton) Blake.—C. A. WEATHERBY, Gray Herbarium, California Shrubs.[1]—This work is a worthy companion to the earlier *Illustrated Manual of Pacific Coast Trees.* It is well conceived, amply illustrated and handsomely bound. The book includes, according to the author's statement in the preface, "all of those vegetative forms classified as woody perennials and semi-woody plants except trees and the succulent-stemmed shrubs of the Cactus Family." Trees are contrasted with shrubs on page 7 of the introduction where it is stated "In trees the stem is a single woody trunk and does not branch for some distance above the ground. In shrubs the woody trunks branch at or near the ground and the stems and branches grow to form bush-like plants". Just where the dividing line may be drawn between a shrub and an herb with a woody perennial base is not disclosed. It is obvious that the decision to call certain plants shrubs and others trees on the one hand and herbs on the other hand must be somewhat arbitrary. In certain genera such as *Salix* and *Quercus* where reasonable doubt may exist in the reader's mind as to a plant's status it would have been helpful if the relatively few species excluded as trees had been included in the keys. This procedure was followed in some cases such as *Eriogonum* where certain herbaceous species are incorporated into the key.

In a book designed primarily for the general public there is always the danger of sacrificing accuracy in keys and descriptions in order to obtain simplicity. McMinn has evaded this pitfall and has included in his introduction a clear and concise explanation of terms to aid the reader.

The major portion of the work consists of keys and descriptions of the various species. The distribution of each species is also noted as well as valuable information on the cultivation of the plants in the garden. Most of the species are illustrated by small but pertinent cuts which are supplemented by many excellent half-tones. At the end is a glossary of botanical terms and a glossary of the meanings of specific names which should be of interest to many users. There is also a supplementary chapter by Fred H. Schumacher on the use of California shrubs in garden design.

I should think that the book would be indispensable to anyone interested in the flora of California.—Stuart K. Harris, Boston University.

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[1] *An Illustrated Manual of California Shrubs,* by Howard E. McMinn. 689 + xi pp.; 775 fig. San Francisco. J. W. Stacey, Inc.

Volume 43, no. 508, including pages 97–157 and plates 654–656, was issued 8 April, 1941.

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